

February 8, 1930

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# AVIATION

*The Oldest American Aeronautical Magazine*

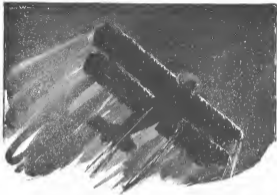


THE *Curtiss "Tanager"*

THE STORY OF THE *Safety Competition*

*Sales Policies* AND THE PRIVATE BUYER





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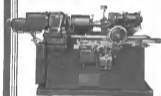
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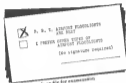


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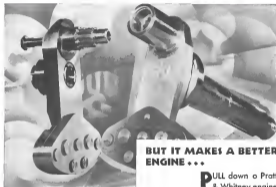
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THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

A MONTHLY-DELT PUBLICATION ESTABLISHED 1910

EDWARD F. WARNER, Editor

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### Three Thousand Miles from the Facts

**F**OR a number of years we have been reading with enthusiasm despite the writings of our confederate C. G. Grey, critic, publisher, and general misquoting of *The Aeroplane* of London. Mr. Grey is always entertaining, always ingenious, always startling—but unfortunately he is not always accurate. Writing up the Guggenheim Safe Aircraft Competition in detail in a recent issue of his journal, he has, it would seem, been rather badly misled by second-hand information.

An erroneous account of such a competition might be unimportant if it came from a less talented and conspicuous pen, or if no international element were involved. Under the actual circumstances it assumes considerable importance and demands some detailed analysis, for the impression left in the minds of readers knowing nothing of the facts would unfortunately be that the officials of the competition were both unimportant and incompetent, and that they set out with the deliberate determination of bringing an American plane home the winner at all cost.

Where there is so much that is inaccurate or misleading it is necessary to proceed to correct the impression left upon the minds of our readers, both at home and abroad, by selecting a few typical examples. An extensive discussion of every point would use up our entire editorial space and something more besides.

Then Mr. Grey states that "the day before the last day fixed on which competing machines could arrive at the field without being disassembled, the Handley Page was the only machine on the spot. All the other European entries had been cancelled and none of the American entries had arrived." Whereupon the editor goes on to explain that the officials wanted the rule requiring arrival by a specified date (October 31)

What are the facts? They were given in *AVIATION* for November 30. One of the American competitors had been submitted for trial in June. Another came along in September. Then (we quote from our own article of November 16) "With about four days to go, things began to happen. The Curtiss was flown to Mitchel Field and officially turned over. The Command-Arm arrived by air, as did the Flettner. The Schneider-Wentworth, which had never yet been in the air, came in by express from the plant at Hanswadeport, where it had been built." The only basis for the suggestion that the rules were waived is that, since bad weather had interfered with flying for several days before the closing date the officials of the Board decided that any machine which had been ready to start by air by October 31, and which had been governed from doing so only by the weather, should be allowed to report when and as soon as the weather permitted. Two planes arrived after October 31. Neither of them figured in the slightest degree in the final reckoning.

Let us have another example. Mr. Grey further declares that in order to prevent the competition breaking down entirely, when it was found that only the Handley Page could pass the stability test, "The Committee altered the rule to read that after driving the machine must right itself without the controls being handled,—except those operating the aileron devices." To that, we can only oppose a flat contradiction. There was no such alteration of rule. There was no alteration of any rule affecting the stability tests. Only one possible explanation occurs to me for the fact that machines with manually controllable flaps were allowed to do their free-control stability test with the flaps up. The flaps had to be somewhere and

that assumed the most logical position. To have required that there be complete line-of-sight visibility with every possible day setting would be almost as absurd as to demand that a machine should stop at the same speed, or at least at a speed within the normal flap range, for all extremes of the adjustable stabilizer.

There follow various inaccurate statements or misleading implications, which we will not attempt to report in detail, about the relative performances of the two leading machines, and a goodly number of suggestions of possible or probable error in the methods of testing employed. The statements made about the test methods and the condition of the instruments used, is that, would convey the depressing conviction that the comparison was complicated by errors.

We can claim some degree of familiarity with flight testing methods including British and Continental as well as American practice. It has been our privilege to discuss the subject with admitted experts in several countries and to share in some of their work. We can say without reserve that we have never seen tests more carefully made or productive of more consistent results than the final series (the only ones that were counted upon the two machines undergoing the complete series of tests) at Mitchell Field this past fall. Instruments troubles developed. They usually do in any long series of experiments under difficult conditions. They were rectified as discovered. Results were checked and cross-checked. Technique was steadily improved, and in the final series of observations the results obtained were, we believe, substantially beyond reproach.

It should not be necessary to enlarge upon such points, or to appear to defend the competition and its officials. We feel inclined to apologize for having done so, but we cannot allow attack or insinuation to pass unchallenged, especially when it may carry a most misleading impression to far-minded men beyond the seas. We have written with no desire to uphold the Curtiss Company or to condemn its principal competitor which had excellent qualities and was having upon power research work that we regard with profound admiration. We have only one remark: that the facts shall be accurately stated and accurately interpreted about a competition of enormous significance which was freely thrown open to the entire world.

///

### On Doing the Pilot's Thinking for Him

**R**EADING the new regulations just promulgated by Assistant Secretary of Commerce Young, requiring all transport planes to remain at a height of at least five hundred feet at all times, we find ourselves in a somewhat peculiar position. We have pleaded the cause of safe flying and of safety study in stress and

out, and we flatter ourselves that no one has been more persistently devoted to that topic. We have been almost uniformly in sympathy with the courses taken by the Department of Commerce's Aeronautics Branch, and have been almost unwavering in praise of their policy. Yet now, when we find ourselves in disagreement with them, it is upon the wisdom of an act specifically and solely directed to increase the safety of operation of transport planes.

We do not, to be sure, dissent from the soundness of the piloting process which the new rule demands. While there are circumstances under which it is safe to fly a large transport plane at less than five hundred feet, they are exceptional. Lower elevations are never to be recommended—but to disapprove the practice that the rule forbids is one thing; and to approve the rule forbidding it is quite another. Never yet has anyone discovered means of making one careful, or of making them exercise foresight, by fiat. There is no substitute for common sense and discretion, and they have to be generated from within. They cannot be imposed from without.

It such a practice as that just ruled by the Department of Commerce is a proper one, and we believe that it is, then it ought to be followed by every competent pilot of his own accord. If he needs some higher authority to tell him how to fly he should not be allowed to fly with passengers at all, for he is sure to find some way of getting himself into trouble, however many devoted supporters may be had upon him.

It is not only that such a rule should be unnecessary, with proper personnel, or that the very fact of its imposition indicates a serious doubt of the piloting personnel's qualifications. It may even prove positively dangerous. A pilot who needs guidance of that sort to tell him at what height he should fly with passengers under bad weather conditions may gain as easily go further and take it for granted that he has done everything necessary when he has followed out the letter of his instructions. To order the pilot to remain at a height of five hundred feet is not by any means to assure him that five hundred feet is always a safe altitude—yet the danger is that a man whose own judgment is so questionable as to need such sort of instruction will take it so as providing not only a necessary but a sufficient course.

The primary function of the Department of Commerce is to determine the qualifications of the personnel and of the apparatus, to make sure that it is competent to operate safely and that it is equipped to do so. We warmly applaud the intention that the Department is henceforth to have as its aim, as to the tests followed and the ground organization and the special instrumental or communication equipment, as well as the bare airplanes and the operating personnel. Accidents result not from deliberate seeking after danger, but from insufficient competence somewhere along the line. Once that is assured, the making of a good safety record should

follow automatically. Get men who know how to operate, and it will not be necessary to tell them how. Get men who do not know, and enough instruction to fill an encyclopedia will not keep them out of trouble.

///

### Better Fuel and Less of It

**I**N THE REPORTS of Congressional hearings, there are a great many things behind tabulations of money already expended. So is a mass of unexpected and interesting information. In so reporting the estimates for fuel for airplanes for the coming fiscal year to the Committee on Appropriations of the House of Representatives, the Chief of the Air Corps explained that a marked change of policy was in progress—that unit costs for fuel would be higher in future because of a more extended use of super high-grade gasoline and gasoline doped with tetra ethyl lead.

We must take one of the best pieces of news that the dawn of new year could bring. Too long has the American aircraft operator had to wear "domestic aviation gasoline," the standard fuel on sale at every airport, as a silhouette around his neck. Too long have engines been designed with reduced compression ratios and intake manifold pressure, built with increased weight of material and excessive resistance and fuel consumption, in slavish devotion to the principle that they must demand no treatment more drastic than the "D.A.G." of the Federal Fuel Specifications Board. Even with the coming of ethyl, making it possible to rectify the dramatic qualities of a low-grade gasoline by adding to it a little bit of another fluid, prejudice against "rich fuel" and "rich engines to take advantage of them" has died hard.

For years American aircraft engines have been built to operate upon a fuel of which the best that can be said is that it was an appreciable improvement over what was commonly poured into the tank of a Model T. Our friends abroad have had no such handicap upon themselves. We have greatly admired the performance of the British engines that have won the last two Schneider races. They deserve admiration, but it is well to remember that they did not make their records upon ordinary run-of-the-mill aviation gasoline. For from it they were not even the direct descendants of commercial power plants designed to run upon that fuel. European factories have for years been building engines for us with a brutal or ethyl blood, and with nothing else—no do we see any good reason why they should have been so much more doing so. It was upon our own side that the error lay.

We are well aware that this will be reckoned as heavy by some of the most distinguished of power plant authorities. We shall have to choose that. It is our story, and

**T**HE *Coversation Department* desires to make the announcement that the classified and alphabetical index for Volume II of AVIATION is now ready for distribution to all those who desire same. This index covers the issues of AVIATION from July to December (1938) inclusive.

All requests for the index should be addressed to: . . . *Coversation Department, McGraw-Hill Publishing Company, Inc., Tenth Avenue at 36th Street, New York, N. Y.*

we stick to it. We are even prepared to defend it at length.

Half a dozen years ago it could fairly be argued that special fuels were so hard to come that every airplane must be prepared to use automobile or motorboat gasoline in an emergency. With approximately a thousand airports in full swing in the United States that plan has lost as force except in very special cases. Refiners of gasoline are prepared to produce better fuels, and airport managements will make them, as soon as a demand becomes apparent. At least the transport companies, doing all their flying in fields where they control their own fuel supplies, can shed the troubles—and increase their engine power and cut their needed tankage simultaneously by mixing compression ratios and supercharging. Already, it is gratifying to note, certain air companies have pioneered the way by adopting their own specifications for a product of much higher grade than the present standard. It is possible to prepare, by methods known at the present time and from crude oils now available, a fuel that will actually be worth to the commercial operator at least eight cents a gallon more than what he is getting now. It will now be that much money, but as a matter of fact the extra cost need not be as much as that.

The Army's action is important not only as showing the growing strength of the improved-fuel cause (the Services might have taken such action much more promptly than they have, were it not for the difficulty over the competition of water-tight specifications for air-locks quality), but also for the pressure that it brings to bear upon engine builders, refiners, and especially upon the managements of the fields that Army planes are likely to visit. With the Army and Navy agreed in demanding what used to be called "fighting grade" gasoline as the standard supply for a large proportion of their aircraft engines, the small commercial operator or the individual wanderer by air should be prompt to reap the benefits of better engines and lower consumption—if he is wiser to his own interests.

# THE GUGGENHEIM Safety Competition



FIG. 1 Equipment for testing instruments

By WILLIAM G. BROWN

*Professor of Aeronautical Engineering, M.I.T.  
(on leave of absence, Technical Staff of the Guggenheim Fund)*

THE David Guggenheim Safe Aircraft Competition, which culminated in the award of the first prize of \$100,000 to the Curtiss Aeroplane & Motor Company, was announced on April 25, 1927, for the avowed purpose of achieving "a real advance in the aerodynamic characteristics of heavier-than-air craft without sacrificing the good practical qualities of present day aircraft." Rules for the competition stipulated that the competing airplanes must pass certain qualifying requirements, after which they might compete for five safety prizes of \$20,000 each, and for one first prize of \$100,000. The safety prizes were to be awarded to the first five airplanes passing the prescribed safety tests and demonstrations, and the first prize (less the safety prize, if already received) to the airplane making the highest number of points in series of the safety competition tests.

Although the Competition was opened on September 16, 1927, no entries were received at Mitchel Field, where the tests were conducted, until September 1929. This was less than two months prior to the closing date. Of the twenty-seven competitors who signified their intention of entering the competition, only fifteen actually presented airplanes for test. Of the number presented, three were withdrawn, two were damaged in preliminary test flights, and eight failed to pass the preliminary requirements. Of the two airplanes which were serious competitors for the safety prizes, only one, the Curtiss "Tanager," was able to pass all tests satisfactorily.

THE tests conducted by the Guggenheim Safety Competition focused attention for the first time on the measurement of safety performance of aircraft. As outlined by the Fund, the proof of safety in aircraft involves flight at comparatively low speed. This is a phase of aircraft performance never before carefully considered in standardized performance tests, which are largely the outgrowth of the military acceptance tests of the war period. As demonstrated by advanced performance in landing speed and take-off distance for



FIG. 2 The speedometer shown in the long tubular body, used after 300-mph flight, when the data were made

## THE Curtiss "Tanager"

commercial aircraft tests of this sort involve difficulties and inaccuracies not encountered in the measurement of other performance characteristics. This is not only because of the fact that at low speed measuring instruments are inaccurate, but also because of the relatively large effect of uncontrollable conditions of test environment, such as wind ground smoothness, etc. Fortunately, all competition tests in which these uncontrollable factors played an important part were made in the autumn months when air density conditions were nearly standard. However, at times it was necessary to wait for days in order to get normal air density at the ground, a low wind velocity, and a dry and fine landing surface. Even under what seemed to have been ideal conditions, differences in the results of duplicate tests occurred, and it was necessary to run many checks, and sometimes comparative tests on competitive airplanes simultaneously, in order to get truly representative results. One fact brought out clearly, was that with the manually skilled test pilots available to the Fund any discrepancies in test data were not the result of piloting. Wherever duplicate tests were carried out under similar conditions, but with different pilots and observers, the results checked reasonably within the precision limits of the test. This showed that the personal equation had been reduced to an minimum.

In the actual measurement of the various performance characteristics every reasonable precaution was taken to

*The Guggenheim Safety Competition involved very difficult and in some cases novel problems of testing methods. In their solution by the technical advisers and observers Professor Brown as chief observer had a leading part. In the article here presented Professor Brown, formerly of the Langley Field staff for the National Advisory Committee for Aeronautics, has explained in detail both the methods of testing and the way in which the "Tanager" reacted to them.*

insure accuracy. The instruments used were the best obtainable. All these instruments were calibrated by a competent agency. For certain instruments such as altimeters, air-speed gauges, and barographs, special calibrating equipment was installed in the competition hangar (Figures 1 and 3), verified by a representative of the Bureau of Standards, and used for checking the various instruments after each test flight, or whenever there was any doubt as to their reliability.

As soon as entered by the Fund, each airplane was carefully inspected by the test personnel, and by at least one technical adviser, in order to determine so what extent the basic qualifying requirements had been met, and in order to insure reasonable safety to personnel during the flying tests. The weight of the useful load to be carried was then computed (5 pounds of useful load for each unit of rated horsepower), and the weight of each item recorded as it was placed in the airplane. The useful load was finally brought up to the required total by the addition of lead in the cabin compartments. In the case of the Curtiss "Tanager," the required useful load was



Professor Brown (left) and Mechanical Engineer Leonard (right) before the "Tanager"

### The Results of the Tests on the "Tanager"

	Test Points	Limit Points	Final Points
Maximum speed (m.p.h.)	111.9	110	110
Use. horizontal speed (m.p.h.)	86.4	75	68
Min. gliding speed (m.p.h.)	59.1	54	54
Rate of climb at 1,000 ft. altitude (ft./min.)	300	400	300
Landing gear (ft.)	40	40	17
Landing distance (ft.)	293	340	215
Take-off run	320	300	0
Take-off distance over 15-ft. obstacle	560	560	560
Pitched climb (degrees)	0	0	None
Reputed pitch (degrees)	12.2	10	None

### ADDITIONAL DATA

Weight empty (lbs.)	1,531	Payload requirement (at 1,000 m.p.h.)	124
Useful load (lbs.)	495	Weight loaded (lb. w/o fuel)	84

800 pounds, of which less than 100 pounds was lead. In order that the weight and center of gravity position of the airplane would not be changed seriously by the consumption of fuel, all flight tests were limited to one hour duration.

Height above sea level flight at the ground was determined by timing the passage of the airplane over a measured speed course and averaging the ground speeds in two directions. At least three flights in each direction were made over the course at a time when the standard altitude corresponding to the existing density at the ground was within a thousand feet of sea level. The flights were made at a standard altitude of 20 to 30 ft. only on days when the wind was blowing along the course at a velocity of less than 30 m.p.h. Fig. 2 shows a mosaic of the speed course, but not over level country border a high section but of the Long Island Lighting Co. The presence of the high towers were given an indication of the proper height of flight and aided against deviations from a straight course. The course was surveyed and its length of 11 722 ft. certified by a licensed civil engineer. Timing over the course was done by the observer in the airplane, who also noted the r.p.m. of the engine in order to determine the power of the engine was in agreement with its rated horsepower. The high speed of the "Tanager" was found to be 111.6. Only two other airplanes were able to pass this first preliminary flight test requirement.

The second preliminary test carried out was the measurement of rate of climb at the ground. This was measured in the usual way, using a Pitot-static probe to record changes of pressure which were later converted to changes of altitude by the use of the tables in NACA Reports Nos. 216 and 218. The indicated rate

greater than that given by the well-known approximate formula

$$P_s = P_s + P_a - P_s$$

where

$P_s$  = Indicated speed of maximum rate of climb

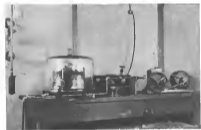
$P_a$  = Minimum flying speed

$P_s$  = Indicated maximum level speed.

The best rapid rate of climb of the Tanager occurred at an indicated speed of 80 m.p.h., whereas the indicated speed of best rate of climb as given by the approximate formula, is 57 m.p.h. The reason for this apparent discrepancy lies in the fact that the airplane with its slots closed and flaps up for the best rate of climb would have had a minimum flight speed considerably in excess of the maximum speed determined with the slots and flaps in action. At sea level the Tanager was found to have a rate of climb of 700 ft. per min. so that it passed with a good margin this requirement of the competition as did all other entries tested.

One of the tests which required the greatest amount of care and attention to detail was the measurement of maximum speed in glide and at level flight. This was especially true since for this test points could be

Fig. 1 (Left) Pitot-static probe for calibrating barographs and altimeters. Fig. 2 (Right) Training Pitot-static probe and meter maintained by the Pioneer Instrument Company.



correctly record the fast start and since two of the competing ships had performances in gliding flight very close to 38 m.p.h., the requirements specified in the rules. In the case of the Tanager an error of measurement of one quarter of a mile per hour in minimum level flight speed would have affected its final score by 5 per cent.

Among the considerations which decreased the choice of method used in measuring maximum speed were

1. The Tanager when flying level at maximum speed tended to oscillate slightly if disturbed by an air bump. If this occurred, the airspeed underwent several values per hour before the plane could be brought back to its proper attitude. Since the rules of the Competition implied that the maximum speed credited to the airplane must be maintained for a considerable time, it was necessary to have particularly smooth air conditions before

the plane could be fairly tested.

2. Timing the airplane over a ground course would involve relatively large errors, if changes in wind velocity occurred, and could not carry out at sufficiently high altitude to ensure smooth air conditions.

It was finally decided to utilize the method developed by the National Advisory Committee for Aeronautics, in which a suspended Pitot-static tube (Fig. 4) is trailed below the interference region of the airplane. The particular Pitot-static head used, shown in one of the illustrations, was made in accordance with the specifications of the Pioneer Instrument Company. Its calibration, carried out by the Bureau of Standards, showed that the pressure difference produced was below the theoretical, due to the length and contraction of the Pitot tube. This made it necessary to correct all values of indicated airspeed by multiplying them by 1.035. The gauge used in the cockpit was a special Pioneer instrument with the dial graduated in units of one mile per hour. Immediately after each test this gauge was removed from the airplane and the true pressure difference corresponding to its indication determined by a NACA micro-monometer (Fig. 5).

The pressure difference so obtained was converted to airspeed through the use of the table of "Pressure of Air on Coming to Rest from Various Speeds," contained in NACA Report No. 297. The only correction to this indicated speed was through the use of the factor 1.035, since, regardless of the altitude at which the tests were made, the Pitot-static tube gave the speed performance at sea level. In order to insure accurate results, the trailing Pitot-static head was supported and the trailing installation checked for leaks before all flights. Also, the temperature of the calibrating room was maintained at 22° Centigrade, for which the constants of the micro-monometer and all other calibrating equipment were known. The actual plotting was simplified by the installation of the airspeed meter gauge and a sensitive barograph attached at a point on the instrument board which was visible to both the pilot and the observer.

As a second method of measuring maximum speed of flight the Pioneer procured two air logs shown in Fig. 6, which were designed and built by the British firm of Barr & Stroud Ltd. These air logs were so designed that when suspended beneath the airplane the revolutions per minute were recorded in the cockpit. By the utilization of the proper conversion factor the true speed of the airplane through the air could then be determined. In several tests in which maximum speed was determined by the use of both the suspended Pitot-static tube and the air log, checks within 0.2 m.p.h. were obtained. However, since a density correction had to be applied to the maximum speed readings obtained from the air log, in order to convert them to airspeed speed at sea level, and since the air log was found by the



Fig. 4 NACA micro-monometer used in calibrating air speed meter gauges.

Bureau of Standards to have a large temperature instrumental error this instrument was not considered as satisfactory as the trailing Pitot-static tube.

The maximum horizontal flying speed of the Tanager was found to be 30.6 m.p.h., which was 4.4 m.p.h. under the selected maximum, and 28 m.p.h. lower than that of any other plane tested. In the case of the Tanager the maximum horizontal speed was obtained with the throttle wide open, although for at least one of the other airplanes, in the configuration, the maximum speed was obtained with the engine throttled somewhat. Maximum speed in glide was obtained with the engine throttled to 500 r.p.m. For the Tanager, the only plane to meet the requirement of 38 m.p.h., the value was 37.1.

In the measurement of landing rate a number of observations were placed on a line parallel to the direction of landing. The point at which the airplane first touched the ground was sharply defined by marks made by the landing gear. The distance from this point to the point at which the airplane finally came to rest was measured by tape. At the instant when the airplane touched the ground a determination of wind velocity was made by a Short & Mason anemometer located as near as practical to the landing line. The landing rate corresponding to this second condition was obtained by plotting length of landing run against wind velocity and by drawing a straight line through the mean of the representative points and through the 38 m.p.h. point on the wind-speed axis at which wind speed the airplane was assumed to have zero run. The intersection of this line with the axis wind-speed axis was taken as the landing rate. Any attempt to take account of variations in ground friction was found to be unpractical, and to avoid discrepancies due to this cause tests on opposing surfaces were carried out on the same day, with the minimum possible time interval. In spite of these precautions, the results of the landing rate tests showed rather wide discrepancies, due to irregularities in the ground at point of contact and to gusts of air encountered just as the airplane was landing. The Tanager was screened with a landing run

of climb to determine was then corrected by multiplying it by the ratio of the observed static absolute temperature to the mean absolute temperature for the same pressure altitude recorded as given in the tables. Air temperatures were obtained by a static thermometer which had been calibrated previously against a standard thermometer in the meteorological office at Mitchel Field. During this test it was discovered that airplanes such as the Tanager climb fastest at an airspeed considerably

of 30 ft., well under the requirement, but still 30 ft. above the leading run of one other competitor.

**T**HE MAIN part of the safety tests was intended to demonstrate the ability of the airplane to land in and take off out of a small area surrounded by obstacles. The obstacles at the tips of the field were simulated by lines of light radiating outward from the top of a 35-ft. tower located in the center of the field. In measuring the distance used in landing in a confined space, the airplane glided into the field by the tower and an observer in the tower followed at a right level until the airplane had settled down to the 35 ft. altitude. He then fixed the position of the sight, thereby determining the line of the imaginary obstacle over which the airplane had just passed. At the same time the observer on the ground determined the line of approach of the airplane, its point of contact with the ground and final stopping point. Distances were measured along the landing line from its point of intersection with the phase of the imaginary barrier. These landings were made with the engine ignition switched off, and the results of the tests were corrected for wind velocity, using the method already outlined in the measurement of landing run.

Distances required to take off over an obstacle were determined in a similar way, except in this case the observer in the tower followed the airplane with his sight, and stopped at the instant the airplane rose above the 35-ft. level. The distance corrected to zero wind velocity required to land the Tanager over the obstacle was found to be 293 ft., and the take-off distance over the obstacle 500 ft. The take-off distance just within the limit of the competition was greater than that of one other plane tested by 40 ft. However, due to its rugged landing gear, which made it possible to land the "Tanager" from a steep glide, the landing distance over the obstacle—253 ft.—was the shortest recorded for any plane.

Another requirement of the safety tests placed limits for the steepest and flattest glides that could be made. These angles of glide were determined as the ratio sine of the ratio  $\frac{\text{vertical distance}}{\text{speed along the flight path}}$ . Speeds of descent

were measured by barograph in the same way as rates of climb, and were corrected for air temperature. Airspeeds along the flight path were determined by the method previously mentioned and were corrected for air density. Considerable difficulty was experienced in getting good checks on glide characteristics, presumably because of the effect of rising and descending currents in the atmosphere. The "Tanager" and other airplanes tested had as difficulty in meeting the flat glide condition of 8 deg. No airplane tested, however, was able to meet the steep glide condition, and the angle of glide of 13.2 deg. for the Tanager was the steepest recorded for any of the planes.

As no credit points were assigned to this performance characteristic and as its accurate determination was very difficult, this requirement was modified in the rules from 16 deg. to 12 deg. in order to permit its accomplishment by those planes which had passed the preliminary requirements.

The stability tests carried out on the Tanager were divided in two parts, the first having to do only with longitudinal stability and required that the airplane be dynamically stable when trimmed for glide, level flight or climb with various throttle settings. During these tests the rudder was controlled for straight flight. The airplane was manually stable over the complete range of speeds and oscillated with a period of about 20 sec. when disturbed from normal flight. The damping coefficient was not as great as might be desired, since the airplane, when flying at high speed and with throttle closed, required three or four complete oscillations to settle down.

The second stability requirement specified that the airplane must fly in steady air with all controls free, trimmed for any flight condition between 45 mph and 100 m. p. h. In this test rubber cords were used in the elevator and rudder to assist in trimming the airplane and control for the turning effect of the ailerons. This condition was met in a satisfactory manner by the Tanager, except possibly in one respect. If adjusted for a straight flight at low speeds, the airplane would, on being thrown into a turn by an air gust, continue to turn indefinitely without increasing or decreasing its rate of turn. The stability characteristics of the "Tanager" were noticeably better than those of any of the others.

**W**ITH respect to controllability the Tanager was especially good except at the minimum speed. Here the throttle advance was very effective and the rudder still satisfactory, but sufficient rudder and all control was not provided when the motor was throttled. This is clearly shown by the wide divergence between maximum speeds in level flight and in glide. With the throttle closed it was impossible to bring the airplane to its stalling attitude even with the stabilizer way up and the stick way back. If when flying under this condition the airplane was disturbed by a gust in such a way that the nose dropped, it was impossible to bring the airplane back to



Some of the personnel of the Guggenheim safe aircraft competition at Mitchell Field.

its original attitude without an increase in speed. In spite of this deficiency in force and lift control is a minimum speed glide the "Tanager" was better in this respect than the other airplanes tried. No difficulty was experienced in maintaining control of the plane when was trimmed to fly at any speed and the motor was suddenly cut. The good directional control of the "Tanager" when gliding at low speeds was undoubtedly due to the triangular shape of the stabilizer, which gave a measure of blanketing to the vertical surfaces.

In the tests demonstrating the ability to recover from abnormal conditions the "Tanager" returned to normal flight after having been down and given free controls. In the recovery from abnormal attitudes, level flight could be resumed with a loss of altitude of less than 300 feet when the controls were used. However, when the airplane was placed in an abnormal attitude, the motor throttled, and the controls left free, it was found necessary to have correct adjustment of the elevator bungee, in order to insure complete recovery without loss of more than 300 feet in altitude. If in this test the airplane was pulled up sharply into a stall, the motor cut, and all controls moved to extreme positions and released, a rather steep dive resulted from which the airplane was slow in recovering. The proper adjustment of the bungee and of the elevator assisted very greatly in the recovery, due to its having an equal resistance to an increase in area of a fixed horizontal surface. The proper adjustment of this bungee cord was so critical that compliance with the conditions of this particular test could not always be guaranteed.

**T**HE FINAL safety requirements demanded that the airplane be maneuverable on the ground in a twenty-perch-per-second wind and that it be able to take off from a square plot 500 ft. on each side and pass over a 25-ft. obstacle along its entire boundary. Also the airplane had to be able to return to this area and land over the barrier, if the engine was switched off after any altitude above 25 ft. had been reached. In conducting this test the motor in the Tanager was cut when an altitude of 100 ft. had been attained, and no difficulty was experienced in meeting the requirement.

The tests of the Tanager and other airplanes in the competition brought out many interesting facts regarding both the design of aircraft and methods of con-

ducting flight tests. They showed how clearly it is possible to design an airplane in any given set of specifications. The Tanager met all the original requirements of the competition, except that of steep glide. This condition had been imposed arbitrarily and it was found that it could not be met by any of the aeromats which complied with other essential conditions. It was finally slightly modified, with the approval of all the judges and of all surviving competitors. Furthermore, the Tanager had very little reserve in passing any of the tests. A second take brought not but to do with the actual performance value of slots and flaps and other lift increasing devices. On the different airplanes submitted almost every known device of this sort was present in some form. Only two airplanes were able to meet the speed range requirements and to compete seriously for the prize. These two airplanes were both equipped with slots and flaps. In one airplane there was manual control of the flaps, in the other high slots and flaps were automatic in action. A real determination of the value of these devices was obtained by speed measurements made with the slots and flaps operative and also locked to prevent their action. These additional data are given below for the Tanager.

Minimum Backward Speed		10 m. p. h.
Minimum Backward Speed	10 m. p. h.	10 m. p. h.
Minimum Backward Speed	10 m. p. h.	10 m. p. h.
Minimum Stalling Speed		10 m. p. h.
Minimum Stalling Speed	10 m. p. h.	10 m. p. h.
Minimum Stalling Speed	10 m. p. h.	10 m. p. h.
Minimum Stalling Speed	10 m. p. h.	10 m. p. h.

These data should remove the skepticism that has existed in this country with respect to the real value of slots and flaps. In addition to these data indicating possible increases in the lift coefficient, the tests showed the disadvantage of having flaps interconnected with the slots and automatically operated. When so arranged, there was a tendency for them to go out of action at the stall, producing a lack of control for that condition, for which control is very important. The tests also showed the necessity of extremely powerful loss and lift controls in order to take advantage of the full value of slots and flaps and the necessity of an extremely rugged and tall landing gear.

With respect to test procedure it has been found necessary to substitute a measurement of minimum speed in level flight for actual landing speed with engine throttled, as has been common practice in some acceptance testing. This is especially true in cases where the landing speed of the airplane is low and where the loss and lift control is insufficient. It has also been found that the use of any approximate formula for determining speed for maximum rate of climb is available when used in connection with airplanes equipped with high lift devices.



Fig. 4. Wind anemometer with four cups mounted on base.

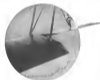
# THE "Tanager" AND SOME OF ITS HISTORY

## A Technical Description and a Chronological Discussion of the Incorporation of the Design Features

By ROBERT R. OSBORN  
Designer Curtiss Aeroplane and Motor Co.



Side view of the main spar and the trailing edge flap.

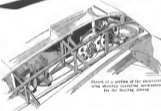


Detail view showing the trailing edge flap and flap hinge.

The extremely low chordline (level) is shown in the sketch of the operating mechanism.



A side view of the Tanager showing the main spar and the trailing edge flap.



Sketch of a portion of the wing showing the trailing edge flap.



The corrected structure of the wing section shown in the Tanager.



Side view showing of the Tanager.

ANY TECHNICAL ARTICLE on an airplane by one of the engineers responsible for it, or the manufacturer producing it, is always open to the charge that the writer's judgment was considerably warped by his enthusiasm. The same charge can be applied in this case, of course, but my enthusiasm is restrained somewhat by the fact that extremely accurate flight test data is available on the plane, as a result of three months of flying with the best obtainable instruments and by flight test personnel with years of test flying experience. When one considers that the data was obtained by such renowned flight testing and instrument authorities as Lt. Stanley Cleveland, U. S. Army, Professor William Brown of Massachusetts Institute of Technology, Mr. Edward Rende, U. S. Navy, and Mr. Thomas Carroll of the N.A.C.A. and under the supervision of Captain Walter Bender, U. S. Army, Prof. Alexander Klemin, Maj. E. E. Aldrin, U. S. Army and Major R. H. Mayo, O.B.E. and considering that in the three months the tests were run a number of times in each line of the flight test manual, and that under many different conditions, the accuracy of the data cannot be questioned. A few years ago it was reasonably safe to subtract 5 m.p.h. from the top speed and add it to the landing speed when one was reading data supplied by the engineer or salesman connected with the airplane. Nowadays the advertising is getting more competitive and it is far safer to subtract and add ten miles an hour to the two speeds. The data obtained by the Guggenheim flight test section is given at the end of this article along with some general characteristics of the Tanager, and if these performance figures may seem disappointing in the light of some of the present day advertising, change it to the fact that the writer of this article realizes that there are others at large who have complete knowledge of the Tanager's actual performance.

It is believed that this technical description of the

airplane will prove most interesting if it is presented in historical form, showing at what stages of the design the various types of construction were adopted, and if possible, why they were adopted. This form of discussion will be used, but before going into it, permit me some comments on the performance of the machine and its future possibilities which cannot be based on the old data given in the table of flight test results.

First, the airplane cannot be spun accidentally. I use the term "accidentally" to include as it is entirely possible that some day an expert pilot may get the machine in some unusual condition—on its back for instance and subject it to some violent maneuver which might develop a peculiar and probably dangerous autorotation. However, Mr. Paul Boyd, Curtiss test pilot, tried unsuccessfully all known methods of putting a plane into a spin, and Lt. Stanley Cleveland subjected it to the rigorous tests required in the Guggenheim flight test manual, several of which tests were designed to develop spinning tendencies if there were any. The Tanager has developed no spinning tendencies that I am aware of. It has been given a thorough trial by a number of other expert pilots also. Therefore it cannot be spun accidentally by anyone, and possibly not purposely by anyone. In making this statement I am not hiding some other unusual condition, such as an uncontrolled nose dive, as this does not occur either. The plane naturally flies slower, lower, and in the power off condition, and if the power is suddenly cut when the machine is completely stalled, full throttle, the nose will drop until the higher speed and the altitude which accompanies it are attained. However the nose does not drop so much that it is in any considerable close to the ground, anything dangerous would result. This test was made during the competition several times and the Tanager made two point landings in each case with the skid about a foot and a half high.

Second, the accuracy for accurate placement of flaps has been eliminated in flying this phase, and the old release of flap perception should not keep the pilot's mind off this type of the ground. The Tanager has been loaded repeatedly by completely stalling it in varying heights up to 200 ft.—altitude and elevator all of the way tail heavy and held in those positions. When this is done the plane settles in a landing position, does not pick up speed, and lands itself with no more slack in the cables than accompanies a normal landing in the usual type of crash. True the ground comes so so fast that one expects the wheels to come right through the wings the first time it is done, but the landing gear is designed to cushion the shock of this gliding condition. It started at any altitude, and it is believed that it will. In this gliding condition the Tanager has no tendency to fall off on a wing and no particular skill is required to accomplish this type of landing. This can be done in gusty or soft entry, or with the flaps either down or up. It was noticeable members of the contest in the last two years, when this type was announced, in which the opinion was expressed that this type of craft, with such a slow landing speed, would be dangerous in windy and gusty weather. The theory was that a change of wind velocity of, say, 5 m.p.h., would have a disastrous effect on a craft with a 38 m.p.h. landing speed, while it would have almost no effect on a plane landing at 60 m.p.h. Therefore an airplane with such a low landing speed might be interesting but not so practical and safe as one with the higher landing speed. This was one of the points we had in mind when we selected considerable flaps for the Tanager. In windy weather one could easily leave the flaps in neutral and effect his landing at 43 m.p.h. instead of 38. Actually, flight test showed that this condition was not so dangerous as everyone had supposed it would be. Gusty weather does, of course, affect the plane when it is flying at slow speed, but not nearly as one might expect, and easy and fully controlled landings can be made in such weather with flaps either opening or not, as wished.

This type of landing can be made in case of engine failure at take-off easily as well as it can be made in landing. Considerable height above the ground is required, the stick is held back from the instant of taking off and the power is sufficient on the plane will land itself in the same way described before. If the failure occurs close to the ground the landing will be two-point and a hard landing, but not too hard to be accomplished without damage under full load conditions. This test has been made with flaps down to their last position only. It must be admitted that the ship might land hard enough to be damaged if the flaps were neutral when this type of landing were tried just after take-off.

Incidentally this is a good point at which to correct another misapprehension which seems to exist about the Tanager. One or two writers, in commenting on this type, say that our flap comes large displacements of the center of pressure, and it is only that we have used them in conjunction with slots, which have a counteracting effect on the order of pressure that we are able to employ without dangerous conditions resulting. We are quite proud of the flap developed for the Curtiss 72 airfoil section and used on this machine. As used on the Tanager this flap does not decrease the top speed area though a large slot is continuously open in front of it, and a mere balance was obtained between the change in center of pressure caused by the flap and its downward

effect on the tail surfaces. The flaps, which cover the entire trailing edges of the wings can be cracked down in any flight attitude of the plane, with any changes in balance being easily taken care of by relatively small movements of the stick. No change of auxiliary position needs to be made in the process of cracking down these flaps, and the front automatic slot does not come into service at all. However the stick tends to become heavier and it is advisable to correct for this by changing the adjustment of the indicator.

Thus, we have simplified the pilot's operation of the controls in a way which I believe is going to have a great importance in the near future. It really was not added our extra control, the crack for the flaps, but this control can be left in any position or not used at all without endangering the machine. In exchange for this one added control, we have eliminated the necessity of using the rudder in executing all normal flying maneuvers. The Tanager can be flown into all normal flying positions and out of them, including right vertical banks, without the use of the rudder. Some normal types of airplanes can do this, but with considerable slipping into the bank and skidding out of it. When the Tanager is rolled with the new Curtiss floating ailerons, the ship yaws in the right direction and keeps in a normal bank position as he is maneuvered. It is well known that the improper use of the rudder is the cause of most of the accidents to the inexperienced pilot. When close to the ground he may make a turn improperly banked, and with his craft nearly stalled, the plane drops uncontrollably or a wing drops off in an accident cannot be avoided. Curtiss Prop Service pilots who have had considerable experience in student training, used to come into the Design Section with that tale of woe very frequently. They would get their students all ready for solo, and before final check-out would properly put the plane in a bad position and, in the process, turn it over to the student. The first bad making the more primitive turn without banking properly. The suggestion was repeatedly made that the rudder be taken away from the student pilot, and that it be coordinated with the ailerons mechanically. This would, of course, prevent him from making a side slip flap plane, but the claim was that the side slip was another maneuver which should be left in the repertoire of the skilled pilot, and that the unskilled pilot, for whom the popular phase of the future must be designed, did not know how to use the side slip properly and effectively anyway. We believe we have accomplished a control which is better than coordinating the rudder and ailerons mechanically—we have an aileron which does not need to be corrected for nor coordinated with by the rudder. We are not suggesting at this time that the rudder should be removed or held fixed—we still may be useful in turning the entire ground maneuvers, even though the plane is equipped with wheel brakes, and the skilled pilot may be able to use it very effectively and wisely. However, we can suggest the unskilled pilot to do his flying entirely with his feet off the rudder control. He can provide accurate maneuvers which go with driving his car. His hands to the right or left, and the airplane banks itself properly and turns to the right or left respectively. His pushes forward to go down and pull back to go up.

The Tanager is not "foot-pilot" and no moving mechanism ever will be—a foot can left, right, or forward. But if he is told that this airplane will be put in dangerous as any other in the hands of the pilot whose



will be flying in to see if he can tear the wings off of a machine designed for commercial land landings or who constantly tries to see how close he can come to banners and high tension wires. The newspapers have expressed themselves ardently as disappointed that nothing more radical than a new system of internal control should develop out of the "Safe Aircraft Competition." This is the unfair and entirely unreasonable criticism. The machine and much safer assemblies, refined fronts and automobiles we have today are only logical developments and improvements of the first ones created, and do not look unlike them, and it is not logical to state that a safe aircraft competition failed because it was not won by something resembling a tennis ball. On the contrary we should be glad we did not have to scrap all of our theories and design data. The requirements of a safe aircraft must be met by a not radical airplane—a practical one that can carry a useful load, and have a reasonable high speed of 112 m.p.h. and cruising speed of 95 m.p.h. in addition to its safety factors. We believe that the Daniel Guggenheim Safe-Aircraft Competition has accomplished its object—"to achieve a real advance in the safety of flying through improvement on the aerodynamic characteristics of heavier-than-air craft, without sacrificing the good practical qualities of the present day aircraft."

One more point should be discussed—the cost of putting a plane on the market equipped with these devices. There is no question but that the ship is a more complex mechanism than the usual type of airplane, but even at that, not so complex as is commonly imagined. However, complexity always adds cost, but any amount is worth it. Another point too, is that a less experienced pilot can be employed safely.

As is in the popular opinion that the high officials of a company merely put gold and credit behind it, it is pleasing to note that the "Tanager" project really started in May, 1937, with letters written by Mr. C. M. Keys, president, and Mr. F. H. Russell, vice-president, recommending that the competition rules be studied by the Curtiss engineering department to see if an airplane could be built to pass the rapid requirements. Preliminary study of the Paul booklet and frequent discussion meetings showed that the problem was essentially an aerodynamic one. Slower flight speeds could be obtained, with a given wing area, by reducing weight or increasing lift or by a combination of both, but large improvements were necessary to meet the demands of the Guggenheim Competition. The weight analysis had to offer only the possibility of using materials or types of construction proven to be lighter but which had their use

precluded by the expense of construction, in ordinary production. Not much could be proven along this line, as the lightest materials and construction are almost always used regardless of expense. They could suggest types of design and structure which had been proven to be lightest, but as this department had been performing this function in all normal design airplanes, not much hope was held for great improvement from this source. The structural analysis had little to offer, as repeated tests had fairly well established the lightest types of structure and nothing outstandingly light and unique could be proposed. However, the aerodynamics section had a number of devices on its research program which showed considerable promise, and as the preliminary investigation was turned over to this section.

An intensive research program was started in September, 1937, in the Curtiss wind tunnel on devices which would improve lift, stability and controllability. Six or seven different types of slot and flap inventions were studied and investigated. Numerous models were built of the more promising types in an attempt to improve them to the point where their use would enable us to design an airplane to pass the requirements. The first tests were also started at this time on the new floating ailerons, which immediately showed great promise. The refinement in the types of aileron slot, and slotted rear flap obtained by literally hundreds of tests and trials, had now developed lift coefficients which, coupled with some rough weight estimates, showed us that, with extremely careful design, a plane could be built to pass the maximum requirements of the competition.

In April, 1938, we wrote to the Fund, advising our intention of entering the competition, and asking for an exact interpretation of certain of the rules which were not quite clear. Obtaining the information we immediately set to work looking for the type of plane which could make best use of our new devices for increasing lift—slots and slotted flaps, and the amazing new type of lateral control which enabled us to use these increased lift devices to their fullest extent. The first decision made was that it was most desirable to build a practical airplane and not a risk, designed to last only for the duration of the contest, would not only be a violation of the spirit of the competition but would not have advanced the aeronautical art in all. We wanted a practical solution of the problem, with a product which would immediately prove useful.

In the course of the study for selecting the final form of the design five different layouts of complete airplanes were made with weight analyses. Tantal models were built of the more promising layouts and these models completely tested in the tunnel. The best model was

ected, of course, and represented the Tanager as finally delivered to the Guggenheim Flight Test Section. Some interesting points which came up in the course of the design are outlined below.

**T**HE REQUIREMENTS of the competition rules that 5 lb of useful load per engine horsepower should be carried, in which useful load could be included fuel and oil for three hours full throttle, and two persons, made the proper selection of an engine very important. There were certain weights which could not be avoided in any design—the weight of engine and cooling system and the 5 lb of useful load per horsepower. If an engine of two



The 110 hp. Curtiss "Challenger" engine in the "Tanager."

hour horsepower were selected, the two percent and three hour fuel and oil would equal more than 5 lb per horsepower and the surplus would be handicapped. If a two high horsepower engine were selected the requirements of low landing speed would make the necessary wing area so large that the plane would be too large and unwieldy. It was on this basis that the Curtiss Challenger engine was selected and the design built around it.

**T**HE CURTISS T-20 section had been selected for all of the slot and flap experiments because it was such a good all-around section. It gave good front and rear beam despite wing roots built at the rear for a good sloped rear flap. An automatic slot and a slotted rear flap had been developed which gave us the following lift coefficients:

Basic section Ky	= .0033
plus rear slot open	= .0035
plus rear flap pulled down	= .0044
plus front slot open	= .0055

which represent a 50 per cent increase in lift due to the front slot and an 80 per cent increase due to the front slot plus a slotted rear flap. These may not seem to be large percentage increases in lift, and it is realized that we were starting with a basic section which was already considered the best in its class. This section also had the advantage that its full scale results were always better than its model tests promised, and this proved to be the case also when slots and flaps were added to it.

To get this slot in its best position it was evident that the commonly used linkage mechanism would not be satisfactory. Links approximately five feet long would

be necessary to get the slot at its best position, so we developed the sliding link type of automatic mechanism, which had the advantage of disappearing entirely within the wing in the high speed condition. It also had the advantage that a gear absolutely stable operation of the slot at all attitudes, and did not flutter in opening and closing. This Curtiss mechanism was also used successfully on the Curtiss "See Hawk" a high speed Navy fighter. After considerable research in the tunnel we had also developed a good slotted rear flap. It was not necessary to close this slot in the normal flap position, as it did not change the L/D characteristics of the wing at high speed. We had also developed a control for this flap which was completely based in the wing at high speed and which had a dead-center position both in the normal and in the full down flap position, so that there was no load in the control in either of these positions. It was also irreversible so that the flap could be left in any position it desired.

The normal wing section has its maximum lift position at 10 deg. The auto-slot starts opening at 12 deg. and is completely open at 30 deg. angle of attack. It is entirely stable in any attitude and because of this gradual opening, does not put the plane. When this slot is open the maximum lift position is at 20 deg. angle of attack. If the rear flap is pulled down when maximum lift position is at 21 deg. None of the lift curves were sharply peaked and none showed dangerous characteristics. The high speeds necessary to obtain maximum lift were not disadvantageous, as the normal ground attitude could be held in the ship and the necessary angle necessary for maximum lift could be obtained from the flight path. Our L/D calculations for the entire ship showed that would probably glide in a landing attitude, which was proved to be the case in actual flight tests.

The large wing area required made it evident that a biplane wing arrangement would be necessary. It was also desirable to make it a single bay biplane if possible for lightness. Our experience has been that double bay biploines often have great advantages—as is evident in our selection of double bay biploines for the Flying Machine ship—that they are heavier than the single bay biploines. This is true even though the single bay lift area gets quite shallow and the beams approach critical lengths. The wings had to have a large open ribbed net gap for stability and maneuverability. Large dihedral angle, and large stagger for vision and reduced interference between the wings in stalled attitudes.

**T**HE NEW Curtiss floating ailerons were the obvious selection for the lateral control. They cannot be stalled in any flight attitude and there is almost no yaw from them throughout the range of wing angles of attack. They were tested thoroughly in the tunnel, in the presence of the wings of the biplane combination, and there would be no yaw from them at all if they were not for the top surfaces of the lower wing and the slight interference with the upper wing. They were compared with the best balanced and differential ailerons of normal type, mounted on the same biplane combination. The rolling moment of the normal ailerons fell off considerably as the stall attitude was reached, and the moment at the low angle of attack of the wings, whereas the floating aileron had constant effectiveness in roll throughout the range. Therefore the area of the floating aileron could be selected so that the lateral control of the airplane could

be fifteen per cent less effective at high speed and fifty per cent more effective at low speed than if normal ailerons were used. The normal ailerons had serious yaw at some attitude of the wings, depending on the size of the protruding balance, whereas the floating ailerons had almost no yaw, what little there was being in the proper direction. These ailerons also make a plane trimmer, when they are used in conjunction with slots and flaps, than if the normal type of control is used, saving equal landing speeds. This feature is extremely important, and is brought about in this way. If we fit all of the wings with leading edge slots and making edge flaps, and have some auxiliary means of lateral control, we can use all of the wings for lift and can reserve the full value of the maximum lift coefficient of .0060. If we must save a portion of our flap for lateral control it is obvious that it must be left in normal or nearly so. This part of the flap can not be pulled down and stalled, as are the rest of the flaps, as it is obvious there will be nothing left for lateral control. Therefore the portion of the wings having ailerons can be calculated for only the reduced lift coefficient of .0051, and, for a given landing speed, the wing area must be larger. On the Tanager about 40 sq. ft. more wing was required using the normal ailerons than with the floating ailerons with the latter giving us more control at the stall. This relatively high drag wing area was offset with forty-five square feet of low drag ailerons. This aileron has a symmetrical section and is down, with supporting struts is less than that of the normal wing area required with normal ailerons. Therefore they pay for themselves in speed, save about 100 sq. ft. of wing, save no connecting rod, give us about 50 per cent more control at the stall and are far less tricky and awkward at high speed. Altogether a very pretty picture.

As there seems to be considerable controversy about the operation of this floating aileron, let me describe it as a low speed condition.

In a low speed condition, a symmetrical airfoil section is used, balanced aerodynamically by placing the axis of rotation at the leading edge, and balanced aerodynamically by an extra weight added to the leading edge. These elements that trim in the air stream at all times and the effect has no control effect on the aileron. This control effect is to displace the air stream with respect to the aileron and will not impact to the plane, in which condition they will roll freely. That is, if it moves his track as it is to cause a 30-deg. angle between the two ailerons, one will first 5 deg. up from the relative wind and one down 5 deg., and this condition will maintain even if the ailerons are in the plane changes. Therefore the plus and minus angles are equal on the two sides of the plane, and as a symmetrical section is used, the up and down lifts are equal. The profile and induced drag are equal, and we obtain lift without yaw. If these ailerons were by themselves there would be absolutely no yaw—the presence of the other wings causes a small interference yaw in the right direction. When a laterally stable plane is rolled with these ailerons, the wing lift has a horizontal component which pulls the airplane into a natural turn which becomes a steady condition, depending on the degree of

bank used. Also let me say that the control is accomplished with a very simple device, and not with any servos, bellows or other devices subject to wear. It is only slightly more complicated than the usual direct connection to the control stick.

Tail surfaces were normal except that large movement of the stabilizer was required. These surfaces were designed by normal means at stalled attitudes and the rigid stability requirements. In this connection all of the stability criteria available was studied and the articles on Spiral Instability, by B. V. Kovner-Kroozovskiy, which appeared in *Aviation* were particularly useful. Even at that, it was difficult to trust empirical data were applied to this craft with the new ailerons. And it was most or less of a guess to design a rudder when there was no aileron yaw to overcome.

**C**ONSIDERING that landings would be made with the Tanager with large vertical velocities, in slow and rubber undercarriage with a large travel was selected. It was necessary also to select one with little or no side-way travel of the wheel accompanying the vertical travel, as the tires would be torn off when landing with almost an forced speed. It will be noticed that this also is inverted and that the plunger comes down below as it is full of oil. The also steel cords heavy bending from landing loads and also wherever the load of landing is not directly in line with the strut. This caused se-



High speed wing section of the "Tanager" before landing.

movable and the strut worked perfectly. This landing gear also has the great advantage that it delivers only pure shocks to the fuselage and carries no bending or twisting to the longerons.

The tail did also an also also and rubber gear, with a two inch vertical motion, as was used also in the landing gear. It is something but is not controllable.

An enclosed cabin was selected for comfort and practicality, even though this involved some weight sacrifice. The passengers were placed in tandem, for better vision and clearance of cabin line.

Fuel tanks were placed on the side of the plane, so as to concentrate the variable load, from a stability standpoint. Wing tanks, in a biplane of large gap, are known to be one cause of peculiar spinning characteristics.

The winging an first built, by the N. A. A. type. This did increase speed, but interfered with the take-off and climb. There was speed to speed so the wing was eliminated in favor of the lower take-off, climb, and the weight saving, which affected the glide.

Final entry was made of the ground design in September, 1938, and the actual detail design was started when it was accepted. As the types and materials of



laboratory, and trying upon itself the behavior of the Tanager in untried birds.

Some apology is due for employing the term "load-proof plane." Literally speaking, as Capt E. S. Lind forcefully pointed out upon the occasion of presenting the Guggenheim Fund's check to Mr. C. M. Keys for the Carina Company, there is no such thing. Of course the test does not literally answer what it says (if it did, I should be less eager to answer its application to myself). The most that can be hoped for is that an ordinary individual of reasonably good judgment and common sense would be able to fly with a very high degree of safety without having undergone any elaborate preliminary instruction and without making such demands upon his physical and nervous qualities as are implied in the present standards universally imposed for pilots' licenses. Nothing that can be done to any mobile machine will ever make it wholly secure against accident. A collision of two Carina-Tangiers would be just as fatal as a collision of two Carina-Robins.

Suppose that you have selected such an individual as is described in the preceding paragraph and undertaken to teach him how to fly. Suppose that no airplanes of dual control are available and that it is necessary to depend entirely upon education for instruction, not necessarily the case when a novice learns to ride a bicycle or even to drive a car. Under those conditions the chances are good that something considerably unpleasant will happen to terminate the first flight. What will it be?

**A**mong my men with reasonably prompt reactional capacities and not unaccustomed to the sensation of speed should be able to drive a properly designed airplane straight across the field and get it into the air. A verbal explanation should suffice to enable a normally intelligent and cool-headed individual to fly an approximately straight course in an approximately even bank, although there will be weaknesses and one wing may be held permanently low. If the novice attempts to continue his experiment very long, however, he is almost sure ultimately to pull the nose of the plane up too far during a turn and either strike abutely and violently

or fall into a spin,—and it would take a very exceptional individual to bring an airplane out of a spin successfully upon the basis of verbal explanation, without ever having previously experienced either that or any other violent maneuver.

If by chance the beginner got into the air safely and flew around for a short time, disaster would be almost certain when landing was attempted. The capacity to judge altitude is acquired by prolonged practice, and early trials without guidance or observation of an expert's maneuver are commands marked by a violent contact with the ground as a result either of flying straight into it without leveling off at all or of landing off with a very high and plunging. Loss of lateral control at a high angle of attack, commonly known as "stalling," and errors in landing are the major causes of the crash. How do they relate to the behavior of the winner of the Solo Aircraft Competition?

**B**EYOND naming that question specifically from experience, I venture another guesswork. A large proportion of all airplane accidents are attributed to "stalling." The term is used so loosely as to bring to mind Charles P. Kesteven's remark of some years ago that "when you say a thing is scientific you mean you don't understand it, and when you say it is technical you mean nobody understands it." If by "stalling" is meant merely the attainment of an angle of attack beyond that of maximum lift, it does not necessarily mean any hazard and need not in itself be productive of accident. The trouble is not with the stall itself but with the loss of control that commonly goes with it,—loss of lateral control leading to spins, slideslips, and other unpleasant phenomena. The proper balance between longitudinal control and lateral stability producing a violent and uncontrolled whirling downward of the nose of the plane when the angle of attack has been too sharp increases. Provide proper control at the stall, such control as there is even now, and you can think that it should be possible to steer, and even the clumsily manual task of turning back into the field when the engine is out just after taking off, even in turn. Provide proper control and the worst that can happen under those circumstances, assuming that the pilot attempts to control the machine at all times, will be a rather violent contact with the ground due to high stalling speed and the possible obliteration of the landing gear, especially if the area be rough or if the machine be pointed somewhat at the instant it hits.

There may sound like almost counsel of perfection. It was quite evident during the competition that a was difficult for those with no previous experience to respond to the instructions. One of the requirements imposed by the rules was that a plane should take off from within a 300-ft. square surrounded by a barrier 35 ft. high, and that the engine should be switched off at any instant



Robert B. O'Brien, designer (left); P. P. Wright, chief engineer of Carina Amphibian  
& Victor Company (right) standing before the Tanager

whereupon the plane must return to land in the square and clear the barrier in doing so. That provision was obviously included as designed to make the Solo Aircraft Competition trial up to a general slaughter of pilots. As a matter of fact, of that requirement is too severe for any existing airplane, the truly safe airplane does not exist. Flares will always be likely to turn back to the field in emergency, and they must be able to do so without fatal consequences.

Let me summarize again for I cannot restate it too often, the qualities of a safe airplane as I view it. It should have three virtually independent controls, with only secondary interaction between them. Moving the stick from side to side should always rotate the ship around the yaw and about axis moving it forward and backward should always rotate it around the transverse axis and the operation of the rudder bar should always rotate the plane around its own vertical axis. In use the accepted aerodynamic unavailability. If the use of the rudder produces rolling or the operation of the ailerons causes the plane to turn, that should be a relatively minor influence. All the controls should always be effective under every possible condition. It should be impossible to relatively graphic movement of the controls (it is hard to presume that the pilot will use jerk the machine into an abnormal attitude) to get into any unstable or uncontrollable position. It should never be possible to get the flying speed down below the minimum permissible value, because whatever happens the plane should go down as the speed begins to drop, preventing the angle of attack from ever increasing to appreciably beyond that of maximum lift, no matter how far back the stick may be held. It is desirable that the plane should put itself in a proper attitude with its controls released, as was in fact required by the rules of the Solo Aircraft Competition, but that is of secondary importance as compared with an absolutely assured controllability at all times, absolute simplicity and independence of the controls, and absolute immunity against dangerous loss of speed. How does all this check up with the Tanager?

However it is hard to say for I never pilot could tell (and I deliberately tried to handle the controls as clumsily as possible) the check is very close indeed.

With the stick hand back and the throttle half closed to hold the plane at a reasonable attitude with respect to the ground, the Tanager can be given some 15 deg. of rudder and skidded around the horizon without back the floating ultralight serving completely to check the natural tendency of the outer wing to rise, even in a fully stalled attitude. It had previously been my opinion, by the lackluster of the officials of the British Air Ministry and of various manufacturing organizations, that it would be necessary to design a special type of skid control, to fly some eight different types of skid control, and experience has made me a strong partisan of the idea, but never have I encountered any other machine in which aileron controls are so completely competent to overcome the natural rolling movement due to turning when stalled.

**P**ROBABLELY most of the experiments just outlined in the last possible concentration upon spinning as a hazard. The Tanager, like other very stable and controllable airplanes, might very possibly could be put into a spin by prolonged effort by an accomplished pilot, but the danger of unintentional spinning by the novice arises in the stalled turn. The sophisticated use of rudder, elevator, and ailerons to produce what seemed to me about the worst possible conditions likely to be encountered by



An excellent flight plane showing action of ailerons, rudder and landing ailerons

a pilot flying normally and not trying to start showed no important loss of control.

Of course it is possible that these Usonian conditions might be destroyed by improper distribution of load or by some particular setting of the naturally uncontrollable trailing-edge flap. There have been a number of airplanes that have had very satisfactory characteristics with normal loading, and most alarming ones with an extra heavy load of baggage behind the rear cockpit. These are things to be investigated and dangers to be guarded against, but in the plane as I flew it I could find no occasion for alarm over the consequences of "stalling." With the stick pulled hand back and the throttle closed on flying a straight course the machine settles on an even keel—as, to be sure, all airplanes with proper load distribution and characteristic should. What slips could be induced by abrupt movements of the stick, but the chief characteristic of our novel did suggest any liability to such occurrence under anything like normal handling. While I cannot say positively that the experience of closing the throttle and turning sharply over the ground has actually been tried, and in any case I had no part in any such trial, there was nothing in the behavior of the machine at higher levels to suggest any real loss of control other than a very rapid loss of altitude, with the accompanying of some longitudinal oscillation, particularly in rough air and consequent inability of striking the ground with the nose somewhat below the horizontal.

The Tanager has two auxiliary controls, for trailing-edge flaps and adjustable stabilizer, respectively. The flap control serves, as indicated in Professor Brown's article in this issue, to reduce the resistance speed by some 6 m.p.h., and is used only for that purpose. Its

effect on control and stability do not seem to be very marked. While the control may appear a little less active with the flap down, it remains entirely responsive. The flap gives, however, an additional member of which to think, and when a machine embodying the principles of the Tanager's design is put on the market, I hope that the flap will be controlled either with the main-race flap or with the elevator control and so will require no conscious thought for its operation.

The adjustable stabilizer is like all other adjustable stabilizers. Considering it as an adjunct of a "loop-proof" airplane, it has too much range of action. With the stabilizer in the intermediate position, the machine flies very nicely with free controls. With the stabilizer wound all the way up, the equilibrium attitude with the controls released approximates a vertical dive. Since we take for ourselves the ideal that, if the pilot runs out of knowledge, the airplane should always get itself out of unpropitious trouble when the controls have been released, it should be responsible chiefly to set any control to correspond to maintenance of an abnormal flight attitude. If the adjustable stabilizer is to be used at all, it would seem advisable to restrict its range to one degree or thereabouts, or just enough to compensate for normal small differences in weight distribution and for small variations in turning speed. If the weight distribution is abnormal, flight is likely to become somewhat unsafe in any case, and in that event it is well to have the pilot constantly reminded of the fact by persistent sub-normal or nose tendencies which will compel him to descend for a re-arrangement of ballast.

The problems of landing remain, and it is a vexatious problem. In the first place, as everybody knows, the mass of technique required for proper landing of an airplane is one of the greatest obstacles to the way of

the would-be pilot. In the second place, if we are to reduce with the possibility of the machine settling rapidly to the ground as full stall is a consequence of trying to maintain altitude or turn with a dead engine at small elevation, an ordinary structure will face the probability of complete disintegration upon contact.

THE ANSWER to all these difficulties lies in a landing gear of massive ruggedness and in a very "soft" shock absorber system, and the Tanager has both. While I do not suggest that such technique is to be considered ideal for it is, say, flying, the operation of landing the Tanager can, if desired, require little more than pulling the stick all the way back and waiting for the ground to come up and hit the airplane. The exactness upon the pilot are nil, except that he must see that the first impact takes place within the boundaries of the landing field,—not a very difficult problem, as the angle of descent in the stalled attitude would be about 12 deg. or still less or about 17 deg. against a 10-mph. wind.

It took the American industry a lamentable length of time to accept the idea of a gear after it had become prevalent elsewhere. It is to be hoped that designers will not have to be equally conservative in taking full advantage of a long-since discovered principle. In the Tanager, the use of a very gentle shock absorber, with the vertical deceleration of the airplane spread over a considerable distance, permits of dropping the plane into the ground at a vertical velocity which may be of the order of 50 ft. per sec. or nearly equal to the terminal velocity for which parachutes are designed without unpleasant shock to the passengers. No feature in my own flight in the Tanager was more pleasantly surprising than the lack of any sensation of violent impact to the ground and the wheels, after having come up towards them with a violent sound in doing rapidly. That, to be sure, does not depend upon floating airplanes or flaps or even upon very light wing loading. It may be achieved wherever desired by appropriate landing gear design.

In writing of the qualities of the Tanager, I have considered it as an exemplification of certain aerodynamic principles and design practices, not as any sort of a commercial illustration of any type of airplane. The essential features of the design could readily be adapted elsewhere. They should not be considered as restricted to the Tanager. It should not be supposed that the results of the comparison have their practical force because the winning machine was designed solely for the purposes of the competition and is by no means arranged and by its other features quite suited for general distribution.

# Sales Policies AND THE PRIVATE PLANE PROSPECT

By

ROBERT E. LEES

Sole Engineer, Waco Aircraft Company

As told to

JOHN T. NEVILL

Second Editor of Aviation

**B**ACK IN 1922 at an air meet in one of our larger cities a man then in the automobile business, who having over the few "summerbird" airplanes located about the airport, had naturally enough, along questions relative to their purchase price, performance, usefulness, etc., etc. He came upon a man representing the manufacturers of a plane that had particularly taken his eye.

"How long," he asked, "would it take me to learn to fly this machine (if I should buy it)?"

The man addressed snarped snarling with his airplane grin about long enough to shorten the conversation with a double-headed one glance, and replied: "It takes 2,000 yr. in the air to make a good pilot."

Sometimes happily the automobile man moved on. Later, he settled up to another airplane and decided to ask the same question of the man he found beside it. "How long would it take me to learn to fly this machine," he queried, "if I should buy it?"

"Well," the second man smiled quite warmly, "that depends upon you. If you are not cross-eyed, blind, or otherwise crippled, I can have you flying this plane by the end of the week."

During the eight years since that air meet there rather good reasons have kept the latter conversation firmly placed in my mind. One is that I was the imaginative automobile man. A second is that the man who appeared so sympathetic about my potential aeronauticalness was C. J. Brinkley, now President of Waco Aircraft Company, with which concern I am connected. And a third is that Mr. Brinkley's answer to my question summed up, and still sums up, the Waco attitude toward the "casual" of flight.

I mean by that that the whole Waco sales plan is based on the fact it is easy to learn to fly. We long ago ceased to look upon the average airplane pilot as anything but a normal, level-headed sort of a man. Likewise, we have ceased to regard the airplane as some mysterious contraption designed only for military talent.

The World War has been restricted with giving an amazing impetus to the cause of commercial aviation in this country. No doubt it did particularly to technical development. But just now, commercial airplane desires, whether they realize it or not, are experiencing sales

*The development of a profitable private plane market is a task that still remains to be satisfactorily accomplished. Small plane manufacturers are making every effort to perform the task, but the biggest obstacle . . . the belief on the part of the general public that flying is both difficult and dangerous . . . far yet to be overcome. In the accompanying article, Mr. Lees tells of the sales policies adopted by the Waco Aircraft Company, and of the success of those policies in the work of building up private plane sales.*

resistance born of "bureaucracy" and "state dentistry," and resulted in the public mind during and subsequent to that War. Let's be honest with ourselves, and with the public to whom we are trying to sell our planes. There is nothing difficult about this business of learning to fly. A man can be a hero just because he holds a transport pilot's license.

WE, as manufacturers, are responsible for a lot of the public's unfavorable attitude toward flying, and while I say unfavourable attitude I mean an attitude not conducive to enlarging the private owner market. Unfortunately, most airplane dealers, in order to exist, have found it necessary to combine their dealerships with an aerial taxi service, "joy-riding" service, or some such business allied with the industry. That means that the dealer has had to sell the public on his own "dare-devilry" and has one "laced heroism." He has had to convince them that it costs a lot to operate an airplane in order to collect the seemingly abnormal price he asks for his



The Tanager is one of the offering made at Mitchell Field.

rides. He also has to convince them that he is assuming a considerable personal risk when he goes up with them to teach them to fly in order to collect what he terms a reasonable sum for instruction. Meanwhile, unconsciously or not, his poses leave the impression that the ability to pilot an airplane is something acquired only after years of study and training, like the skill of a doctor, or brilliance of a lawyer.

On the other hand the dealer's chief interest in selling airplanes as occupation in which he must reserve his arguments in favor of economy of operation, simplicity of handling and safety. That automatically puts our dealer on the opposite side of the fence. In other words, he is assuming to be an *look-alike* of the dealer at the same time, an assumption that puts him in a rather ridiculous light in the eyes of the shrewd prospective airplane purchaser. How many automobile salesmen will admit the difficulty of driving an automobile in heavy traffic? How many automobile dealers have the audacity to charge the auto-buying public for instruction in operating the auto-buying public's own equipment?

We are encouraging our dealers to minimize the opposed difficulty of learning to fly, to tell the truth about the realities of learning to fly. We are encouraging them to adopt selling methods much like those of automobile dealers. An automobile salesman never loses an opportunity to give a prospective purchaser a ride in his car, and a free ride at that. He goes out of his way to carry people places; to give him a chance to be on some service to persons who may or may not be "in the market" for an automobile. The auto salesman's theory



A Miles M-2. Waco says this model is the best flying airplane.

industry to "sell" the general public on the idea that the automobile itself was not nearly so burdensome as some of the least conservative minds perceived it. These pioneer auto dealers, too, had to obliterate the popular impression that driving a motor car was difficult, as well as being dangerous and that its accomplishment was limited to the most destitute and daring of persons.

To day we find the speed record of automobiles has increased from 35 or 42 m.p.h. to 40 or 45 m.p.h., and airplanes are being driven about our highways and our streets. Nearly every adult person in the United States either has one or has had one, and drives himself. Today we aircraft manufacturers are attempting to sell the idea of speed, not to replace the automobile in its entirety, but to replace all modes of surface travel in the particular type of service for which the airplane is preeminently fitted. Our rates of speed increase again, approximately 3 to 1, over the fastest land motor travel, nearly 4 to 1. Just as the early auto dealers were concerned with beating out the legions of driving automobiles, we are confronted with the problem of convincing the general public that it is not difficult to fly an airplane, that airplane pilots are not supermen or abnormal in any respect, and that the average adult person can learn to fly as well as he or she learned to drive an automobile.

Our policy in Troy is to encourage our dealers to develop sales to private individuals. That is the market which we believe, across the largest production, the quickest turnover and the most satisfying profits. And that is the market that must be developed in its fullest sense, if the aircraft manufacturing industry is ever to approach the general Twentieth Century. We are persuading our dealers to attempt to efface from the public mind the thought that flying, or even starting a motor or during. We are asking them to preach simplicity and safety and safety, instead.

Our sales, all along, have been showing a tendency toward the private owner. Four years ago we were selling about 10 per cent of our output to individual owners. Today about half of our production goes to that class of purchaser. That is a hopeful sign that

distributors are reversing their attitude toward the public in order to attract the private owner. We believe the best way to attract the market is through private flying clubs. That, incidentally, is the most cooperative means of getting flying machines. For instance—One club with which I am familiar, has 40 members, and has worked out a system whereby each member can learn to fly well enough to acquire a brand new Commercial Pilot's license at an average cost of about \$5.00 per hour.

Waco, from the beginning, has had a policy of selling through distributors and dealers, and protecting them accordingly. Of all the planes we sold in 1925 not one was sold at retail by the factory so which the distributor got no discount. Our sales policy might be termed one of "low-pressure" selling. During this past Fall we did not load our distributors and dealers with airplanes. The result is that today there is no stock of new planes in storage at Troy and the supply of new planes in the hands of our dealers is very much lower than it was this time last year. We consistently help our dealers to sell but with no hard-boiled high-pressure salesmanship. We keep accurate records of our dealers' stocks on hand at all times and do everything possible to prevent them from getting into an uncomfortable position.

Waco has a recommended fence plan, which has worked out very nicely, but we strongly advise our dealers against long trading on used airplanes. And we keep records of our dealers' stocks of used planes clearly to record them of the output they have laid up in used planes. Our planes originally have a used value which has been quite high in comparison with other used commodities, and our records indicate that the handling of used planes is not the problem it is in the automobile industry. Ultimately, no doubt, that is a problem that will have to be faced in selling airplanes retail to the general public.

Just now Waco has approximately 35 distributors and nearly 300 dealers, and our first interest is to see that these representatives make money. Our factory has had a prime factor in increasing discounts, having done so

before being requested to do so by the distributors. We realize fully that modern sales methods are expensive and the distributor is entitled to a fair profit. However, we have always maintained a high standard of requirements as to a selection of our distributors, these requirements being more inclined toward security than to possibly the size. In fact, we have territory now open that could be closed if our policy was otherwise.

Returning again to private owners let me say that we believe that the development of a sizable market among individual owners will be guaranteed by growth of servicing facilities over the country. Just as *Aviation* has pointed out elsewhere, the private plane owner is going to demand this service. If such facilities are non-existent he will not be a satisfied owner. For that reason we encourage our distributors to carry Waco parts in stock, and, incidentally, our distributors have found that the parts and repair business pays its own way. Some day, and let's hope it is not far off, the service and parts end of a distributor business will be a real profit-maker.

As to advertising. Our policy has been to get value into our planes in order to reduce the cost of selling by advertising. Much of the advertising in this industry we believe, is by word of mouth so far that makes our advertising and sales expense has been low. Just now we are conducting a survey to determine what magazines, outside of the trade journals, can be used advantageously in advertising our product.

We are quite interested in the export market and have made considerable progress along that line. An inquiry from a foreign country gets the same attention to our plant as the domestic inquiries do. We now have distributors in China, Mexico, San Salvador, Brazil, Argentina, and Australia. Our exports during 1925 had a value of approximately \$250,000. Although our production in 1925 had a value in excess of the value of our 1926 production we produced fewer planes, the planes being due to more sales of our higher powered planes.



Action photo of a Waco 100 general with a Miles M-2. Waco 100 is the best flying airplane.

is that those persons who are not "in the market" will be some day, and when that time comes they will have taken in our car, will have known its comfort, its performance and its ease of handling, and he will have a decided advantage over his competitors.

Let's have a sane and honest view as to the skill required in flying, and let's not over-regulate the flying business. Twenty-five years ago automobile manufacturers submitted to the horse-and-buggy traveling public the proposition of descending a "hill" and some "3 or 4 mile-an-hour mode of travel in face of a mode averaging 10 or 12 miles an hour. The rates of speed increase was 3 to 1 and it took several years for the auto



One of the Waco 100s which will be the best flying airplane for the general public.





## To Hold Meeting Of Aero Teachers

**Chamber Body Will Foster  
Event in St. Louis, Feb. 17-19**

NEW YORK (S. P.)—The Educational Committee of the Aeronautical Chamber of Commerce has laid plans for a national conference on aeronautical education to take place at St. Louis, Feb. 17-19, during the International Aircraft Show. This will give visiting delegates a chance to view the latest developments in aviation.

There are 61 universities and colleges which offer instruction throughout the United States offering courses in aeronautics, and these institutions have reported an enrollment of 2,636 students in aviation courses in a recent survey of the Aeronautical Chamber of Commerce. There are also 21 elementary school courses, 55 senior high schools, 150 junior high schools, five aviation schools, eight aviation schools, three trade schools, and one vocational high school offering aeronautical training. The total enrollment of students interested in the industry. During 1949 there was a 10 per cent increase in the enrollment of secondary schools offering courses in aeronautics.

### Four Speakers Highlighted

Prof. Robert H. Spangberg, of New York University, chairman of the Educational Committee of the Aeronautical Chamber of Commerce, will be chairman of the conference. The District Council of the National Aeronautics Association will also be represented. Four speakers, prominently identified with the development of aeronautical education in the United States, will be the featured speakers. They are: Dr. John W. Wilbur, chairman of the District Council of the National Aeronautics Association; Dr. L. E. Bess, Chairman of the School of Education, New York University; and Dr. J. H. Doolittle, Chairman of the Board of the United States.

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### Delegates to Meet in Groups

Progress made in colleges and universities will be outlined by the delegates. Prof. Earl W. Hill, University of Southern California, chairman of California State Advisory Committee on Aeronautical Education, Aeronautical Ground School, will be the subject of a talk to be given by Andrew D. Johnson, head of the Aeronautics and Astronautics Department, Case Technical School, Detroit, Mich.

Dr. J. H. Doolittle, Chairman of the Board of the United States, will be the featured speaker. They are: Dr. John W. Wilbur, chairman of the District Council of the National Aeronautics Association; Dr. L. E. Bess, Chairman of the School of Education, New York University; and Dr. J. H. Doolittle, Chairman of the Board of the United States.

## Canadian Chks Active in 1949

OTTAWA (S. P.)—Colony led the province in 1949 in number of chief executives with a total of 1,000. Statistics were second with 748, and Bureau third with 497. There are now 23 flying clubs in operation in contrast with 14 in 1948, and flying hours last year amounted to 15,480 in against 8,124 in the previous year. In 1949, there were 29 solo fliers, while the League led the state in flying time with a total of 1,481 hr. Some 47 airplanes were in line to the clubs in the last year while an additional thousand were owned by the aviation groups.

## Air Branch Now Has 775 Medical Inspectors

WASHINGTON (S. P.)—Figures released by the Department of Commerce show there are now nearly 775 medical examiners on duty throughout the United States. These work constantly in engineering pilots and aviation pilots in their general and several states for flying before they are licensed, and also in checking those who have received their licenses for medical examination. A rapid increase in the number of examinations conducted by these medical examiners is indicated by the fact that in 1948 there were 1,000 examinations, while in 1949 there were 1,000 examinations, while in 1949 there were 1,000 examinations.

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## Aeronautics Branch Alters License System

WASHINGTON (S. P.)—Clarence M. Young, National Secretary of Commerce for Aeronautics, has announced a new plan for the issuing and renewing of pilot licenses in order to speed up their operation of the branch.

After the original license has been issued, the Aeronautics Branch will only renew it once every four years. The new system will be handled by the Department inspectors in the field. A new type license recently has been issued which enables pilots to renew their licenses without having to appear in person at the Department. This new type license will be issued to pilots who have been issued a license by the Department of Commerce and who have been issued a license by the Department of Commerce and who have been issued a license by the Department of Commerce.

Detained instructions for renewal of license will be mailed to all license holders and they will be required to return the license to the Department of Commerce.

Other Points of Change  
WASHINGTON (S. P.)—Modified regulations for pilot licenses announced recently by the Aeronautics Branch provide that applicants need not appear personally in any subject they have passed in the preceding seven months.

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## Aviation Talks on Aero Union; Senators Written

CHICAGO (S. P.)—Speaking to a group of student pilots of the Chicago office of the Aeronautical Branch, Jack Jackson outlined the work and progress being made by the Aeronautical Branch in order to speed up their operation of the branch.

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## New Standard Plane of Type Ordered by Navy



A \$500,000 plane for New Standard of the Navy, the plane is a two-engine craft employing Warner power. Its dimensions are 30 ft. 10 in. length, 22 ft. 5 in. width, and height 9 ft. 6 in. Gross weight of the airplane is put at 14,610 lb.

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## Approves New American Eagle

WASHINGTON (S. P.)—Approved type certificate No. 204 has been issued for the new American Eagle, a two-engine plane, powered with a Warner engine, weighing 14,610 lb., capable of a 700 lb. useful load, and weighing 1,920 lb. gross.

## Several Orders Placed For Ford Flyer Chutes

WRIGHT (S. P.)—Recently received orders for the Ford Flyer Chutes, a two-engine plane, powered with a Warner engine, weighing 14,610 lb., capable of a 700 lb. useful load, and weighing 1,920 lb. gross.

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## Commemorative Flight Precedes Legion Show

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## Power Plant Makes To Confer in St. Louis

ST. LOUIS (S. P.)—Meeting of the Motor Manufacturers Section of the Aeronautical Chamber of Commerce will be held here during the International Aircraft Show, Feb. 17-19.

The purpose of the meeting is to discuss the development of the motor industry, and the problems and methods of manufacturing power plants will be the subjects discussed.

There is a possibility that a change in the present standard of speed rating for engines will be suggested by the Motor Manufacturers Section. The production reports of 22 engine makers during 1949, presented by the Motor Manufacturers Section, will be presented to the manufacturers. On Feb. 17, the Motor Manufacturers Section will hold a joint meeting with the Commercial Airplane Manufacturers Section.

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Richard Ford, Mr. Henry Hecht in the office of his design New Being Manufactured by the Alexander Almonor Co.

## Production Started On Alexander Gliders

**COLORADO SPRINGS (AP)**—Production has started here on a high-life primary glider designed by the Alexander Aircraft Co. The first of three known as the Alexander Trainer, now sold to Pilot Pro Gliders, Inc., an organization composed of businessmen in Colorado Springs. A number of flights of over 1,500 ft. and of an 80-sec duration have been made from a 30 ft. built into a seat to test the air seat system.

The Alexander Trainer has a fuselage of welded aluminum sheet forming a wing area of 200 sq ft., a 30 ft. wing, and large control surfaces.

Features include three shock absorbers cushioning the steel structure from the main fuselage, control surfaces a light metal seat adjustable to compensate for variations in pilot weight, and a special jettison body from which a tow rope or shock cord can be released automatically or can be released at any time by the pilot.

Laboratory bench down tests on the wings showed a safety factor of 144 with single wing, unpowered, maximum 1,731 lb. load for one hr. maximum. The Alexander firm is making mass production, utilization of present assembly methods and airplane materials plan it will be able to turn out an all-wood glider at a list price of \$255. Plans for testing glider rides are being formulated by the US Lighter-than-air Association and dealers.

## Excess Has Movable Equipment

**LOS ANGELES (AP)**—Small parts assembly tables and benches in the Aero Aircraft factory are so arranged in a manner that they may be moved from place to place about the plant, being provided to rigidly attach them wherever desired. Since the floor of the factory is of smooth concrete it is possible for one man to maneuver the assembly line for any group of parts or any type of assembly.

## Increase Small Firm Capital

**SEATTLE (AP)**—Seattle Aeromarine Corp., located in this city, has increased its capital from \$10,000 to \$150,000.

## Curcio-Roid Rambler Approved

**MONTREAL (AP)**—Having passed the official government test and been approved for various types of flights, the Curcio-Roid glider, known as "Lamborghini" will be put into production at the Curcio-Roid plant in the Curcio-Roid, Quebec, Canada.

## Los Angeles Launches Glider, 3,000 Ft. in Air

**LAKEBURST (AP)**—With the successful launching of a second trainer type Curcio-Roid glider from the Curcio-Roid "Los Angeles" in flight plans are now being considered for supporting projects with them and further testing of the possibilities of refining equipment plans from lighter-than-air craft. Curcio-Roid, William A. Moffatt, Chief of the Navy Bureau of Aeronautics, has approved the scheme could be utilized for developing passengers while a step in flight, and in time of war it might prove useful in carrying men and material to inaccessible areas where other landings could be made as gliders.

Less than 30 minutes after the glider which it had been referred from Seattle to Los Angeles, it was launched from the top of a launch tower at Lakehurst. The glider was launched at approximately 1,000 ft. altitude, gliding for 15 min. and then landing on a runway at Lakehurst. The Navy Bureau of Aeronautics, which is now conducting tests on the glider, is now planning to launch a glider at Lakehurst. The glider was launched at approximately 1,000 ft. altitude, gliding for 15 min. and then landing on a runway at Lakehurst. The Navy Bureau of Aeronautics, which is now conducting tests on the glider, is now planning to launch a glider at Lakehurst.

## L.A.E. to Exchange Certificate

**NEW YORK (AP)**—Henry Hetherton, on behalf of the young trustees of T. A. T. Company, that the young trust agreement dated Nov. 10, 1949, after that date, voting trust certificates may be exchanged for per value capital stock.

## Preliminary Glider Fete

**NEW YORK (AP)**—Plans have been completed for a glider contest to be held at the Old Belcher Country Club, Belcher, Quebec, April 20-21, under the auspices of the National Aeronautics Association.

The Association will also consider a code of ethics to be followed in the production and distribution of airplanes. This is a new law drafted with the hope of eliminating any questionable practices that might have a tendency to corrupt the industry. The group will also determine the need for a personal testing of purchasing agents.

A joint session will be held with the Aeronautics Branch of the Department of Commerce on Feb. 11. The Association will also consider a code of ethics to be followed in the production and distribution of airplanes. This is a new law drafted with the hope of eliminating any questionable practices that might have a tendency to corrupt the industry. The group will also determine the need for a personal testing of purchasing agents.

The contest is planned as part of the advance preparation for the first annual glider and soaring contest which will be held next September in which glider pilots from all parts of the country will compete.

## Pittsburgh, Cincinnati Shows are Sanctioned

**NEW YORK (AP)**—The 1950 aircraft show is to be held during 1950 have been announced by the Aeronautics Association of America. The Cincinnati show is to be held during 1950 have been announced by the Aeronautics Association of America. The Cincinnati show is to be held during 1950 have been announced by the Aeronautics Association of America.

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## Chamber Plane Section To Work Out Sales Policy

**ST. LOUIS (AP)**—One of the most important topics to be discussed during the meeting of the Commercial Aeronautics Manufacturers' Section of the Aeronautics Association of America on Feb. 15, during the air show here, concerns the need of building up of national or craft sales organizations for the present year.

Among the ideas to be presented are the advisability of setting the aid of automobile distributors in handling aircraft sales rather than building up a separate sales organization, and the feasibility of setting monthly production and sales reports on aircraft to members of the Chamber.

The manufacturers will also consider a code of ethics to be followed in the production and distribution of airplanes. This is a new law drafted with the hope of eliminating any questionable practices that might have a tendency to corrupt the industry. The group will also determine the need for a personal testing of purchasing agents.

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## Glenn Meets Committee

A committee of the various aviation standard performance level for gliders will report its findings at the St. Louis meeting. The committee is headed by Paul Alexander, president of the National University and includes a number of prominent aeronautical engineers. It is planned to draw up a report on the subject which will include a plan of gliders to be completed, and in this way it will then be possible to compare the performance of various gliders on an equal basis.

Another important matter to come on the agenda is the subject of glider safety. The report committee has been asked to make a study of the subject and to report its findings to the committee. The committee is headed by Paul Alexander, president of the National University and includes a number of prominent aeronautical engineers. It is planned to draw up a report on the subject which will include a plan of gliders to be completed, and in this way it will then be possible to compare the performance of various gliders on an equal basis.

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## New Equipment for the Austin Co.

**CLEVELAND (AP)**—With the installation of electric welding equipment, The Austin Co. here will be able to double the capacity of its fabricating plant on Cleveland Road.

**Johnston Representative on Tour**  
**DAYTON (AP)**—J. E. Amos, sales manager of the Johnston Aircraft and Supply Co., expects to arrive 25 states and 15,000 mi. in the next three months on a trip during which he plans to call upon every airplane and plane accessory manufacturer and plane operating firm in those states. Amos is making the trip to inspect quality, quantity and shipped loads which carries samples of airplane equipment and supplies manufactured and handled by the Dayton concern.

## New England Plane Tour, Destination, Meet

**SPRINGFIELD (AP)**—An Air of New England Air Tour on May 26-28, departure of the new Boeing airplane, in August on May 30 and June 1, are events announced by the Aeronautics Association of America. The tour will be held in the New England Council's Springfield Chapter of the National Aeronautics Association and the Springfield Air Race Association. The tour will be held in the New England Council's Springfield Chapter of the National Aeronautics Association and the Springfield Air Race Association.

The New England Air Tour is sponsored by the New England Council as a major step in its program to promote commercial aviation in New England. It will start from the Springfield airport on Wed. May 26, and will include a number of stops in the New England states.

Departure of Boeing field will be under the direction of Springfield Chapter of the National Aeronautics Association. The tour will start from the Springfield airport on Wed. May 26, and will include a number of stops in the New England states.

Central offices for most and recent have been established in the new State Building in Springfield. Officials noted that the New England Council and the Air Race Corp. to carry out the tour. The tour will be held in the New England Council's Springfield Chapter of the National Aeronautics Association and the Springfield Air Race Association.

## Diesel Firm Divides

**DAYTON (AP)**—Notice of dissolution of the Davidson Diesel Co. Dayton, Ohio, has been received by the Secretary of State. The firm was owned by G. E. P. and E. H. P. members. The firm was owned by G. E. P. and E. H. P. members. The firm was owned by G. E. P. and E. H. P. members.

## St. Louis Scene of S.A.E. National Aviation Meeting

**ST. LOUIS (AP)**—An event has been decided to hold the National Aeronautics Association of the Society of Automotive Engineers here Feb. 15-16, 1950. The event is a tribute to Col. Charles A. Lindbergh. A program of twelve topics devoted to aircraft engines, instruments, production and rules represent will be presented in their attending the conference. The following is a list of the sessions:

Tuesday, Feb. 15: Engines Session, 10 a.m.; Chairman, E. G. Lighthill. The Week of Aviation Session, 10 a.m.; Chairman, E. G. Lighthill. Power Plant Field Trip, 10 a.m.; Chairman, E. G. Lighthill. Boeing Aircraft Corp., "Wings and Motors in America's Future," 10 a.m.; Chairman, E. G. Lighthill. Wright Aeronautical Corp., "The Nelson Research Automobile and Aircraft Engine Design," 10 a.m.; Chairman, E. G. Lighthill.

Wednesday, Feb. 16: Engines Session, 10 a.m.; Chairman, E. G. Lighthill. The Week of Aviation Session, 10 a.m.; Chairman, E. G. Lighthill. Power Plant Field Trip, 10 a.m.; Chairman, E. G. Lighthill. Boeing Aircraft Corp., "Wings and Motors in America's Future," 10 a.m.; Chairman, E. G. Lighthill. Wright Aeronautical Corp., "The Nelson Research Automobile and Aircraft Engine Design," 10 a.m.; Chairman, E. G. Lighthill.

Thursday, Feb. 17: Engines Session, 10 a.m.; Chairman, E. G. Lighthill. The Week of Aviation Session, 10 a.m.; Chairman, E. G. Lighthill. Power Plant Field Trip, 10 a.m.; Chairman, E. G. Lighthill. Boeing Aircraft Corp., "Wings and Motors in America's Future," 10 a.m.; Chairman, E. G. Lighthill. Wright Aeronautical Corp., "The Nelson Research Automobile and Aircraft Engine Design," 10 a.m.; Chairman, E. G. Lighthill.

Friday, Feb. 18: Engines Session, 10 a.m.; Chairman, E. G. Lighthill. The Week of Aviation Session, 10 a.m.; Chairman, E. G. Lighthill. Power Plant Field Trip, 10 a.m.; Chairman, E. G. Lighthill. Boeing Aircraft Corp., "Wings and Motors in America's Future," 10 a.m.; Chairman, E. G. Lighthill. Wright Aeronautical Corp., "The Nelson Research Automobile and Aircraft Engine Design," 10 a.m.; Chairman, E. G. Lighthill.

Saturday, Feb. 19: Engines Session, 10 a.m.; Chairman, E. G. Lighthill. The Week of Aviation Session, 10 a.m.; Chairman, E. G. Lighthill. Power Plant Field Trip, 10 a.m.; Chairman, E. G. Lighthill. Boeing Aircraft Corp., "Wings and Motors in America's Future," 10 a.m.; Chairman, E. G. Lighthill. Wright Aeronautical Corp., "The Nelson Research Automobile and Aircraft Engine Design," 10 a.m.; Chairman, E. G. Lighthill.

Sunday, Feb. 20: Engines Session, 10 a.m.; Chairman, E. G. Lighthill. The Week of Aviation Session, 10 a.m.; Chairman, E. G. Lighthill. Power Plant Field Trip, 10 a.m.; Chairman, E. G. Lighthill. Boeing Aircraft Corp., "Wings and Motors in America's Future," 10 a.m.; Chairman, E. G. Lighthill. Wright Aeronautical Corp., "The Nelson Research Automobile and Aircraft Engine Design," 10 a.m.; Chairman, E. G. Lighthill.

Monday, Feb. 21: Engines Session, 10 a.m.; Chairman, E. G. Lighthill. The Week of Aviation Session, 10 a.m.; Chairman, E. G. Lighthill. Power Plant Field Trip, 10 a.m.; Chairman, E. G. Lighthill. Boeing Aircraft Corp., "Wings and Motors in America's Future," 10 a.m.; Chairman, E. G. Lighthill. Wright Aeronautical Corp., "The Nelson Research Automobile and Aircraft Engine Design," 10 a.m.; Chairman, E. G. Lighthill.

## Shave Pyle-National Eastern Office

**CLEVELAND (AP)**—An announcement from the Pyle-National Co. here states that the office of its Eastern branch is now located in Room 101 of the Starline Building, Cleveland. The office is now located in Room 101 of the Starline Building, Cleveland. The office is now located in Room 101 of the Starline Building, Cleveland.











## WHAT OUR Readers Say

### "Rate Regulation"

To the Editor:

May I compliment and thank you for your excellent editorial in the January fifth issue of AVIATION entitled "Rate Regulation," particularly that part of it referring to the supposed analogy between airlines and other forms of transportation. It has seemed that the leaders in the aviation industry have too often attempted to apply in a three dimensional field that applicable only to civil aviation and service transportation.

It has also been a pleasure to read Mr. Hildebrand's article on airport problem in New York City, having served as a member of the Post-Paid Convention in 1937, and of its subcommittee on location.

JOHN DENNEY BULLARD,  
New York City

### Aviation Business Men

To the Editor:

Your editorial entitled "Solidarity on Tilt" has been published at a most opportune time, and disinterested readers should be able to see its value to the industry. The establishing of an airplane sales organization with the proper kind of personnel is important. Most important is the executive personnel who must rule the industry to develop and direct the policies of the airplane sales department.

I believe, Mr. Hildebrand, that you can do the industry an immense service of good if you will through your magazine continue to insist upon the fact in every the separation need for business men in aviation, to secure freedom to those who have interest in the future of the aviation.

We must remove ourselves from the idea that the aviation industry is an industry of the air for it is not. Actual flying constitutes approximately ten per cent of the activity. More and more every day we find that flying is only the end result of a large ground activity.

Over a year ago Universal Aviation Staff assigned the need for business men in aviation, and in so doing we advanced this condition, effort what followed to be the first Aviation Business Administration Course in the country. This course was designed to fit an important business need for the

furtherment of an efficient business management in aviation. I believe that the type of executives needed by this Business Course gives an ideal preliminary training for an airplane salesman.

Courses are conducted in the evening. Ten weeks are required for completion of the course, which includes a lecture and inspection tour of factories, and airports, and observation trips of mail, passenger, service, and school business. Lectures are delivered with the aid of electric projection machines for illustrating.

The course covers airplane sales, factory inspection, airplane inspection, financing, distribution structure, advertising, economics, insurance and law, national regulations, including sales, passenger, service, traffic, transportation, radio, airfares, schedules, and Air Commerce rules and regulations, applied economics, navigation, meteorology, instruments, radio, and aerial photography. To make a course of the kind practical and valuable to the industry we have secured as instructors the executives and department heads of our Company, also aviation industry executives, economists, insurance experts, and university professors.

A careful analysis of the types of students should be in the course reveals that over half of the students are taking the course for the definite purpose of applying previous business experience to the aviation work. These students have been selected chiefly from such professions and occupations as pilot, accounting, insurance,

law, traffic, and engineering. If more of this type of personnel can be drafted, aviation will, I believe, become quickly established on a firm and economic business basis; and, in so doing, the best avenue of effort and time will be laid clearing the future period of business expansion.

Our employment manager has indicated that the greatest demand in aviation at present is for men to fill business positions; that the majority of positions in the large air transport companies are held by men who are actively engaged as pilots or mechanics, and, further, that the need for men engaged in instructing. The last is: Aviation is a business and must be recognized as such. It is my purpose to discuss the necessity for engineers, pilots and mechanics.

The man who has a practical and technical background coupled with business experience is an ideal combination for aviation's future. Experience has shown us that it is easier to train a man in the rudiments of flying than to teach a pilot the laws and principles of business administration. And, so it is with airplane salesmen. For every businessman airplane salesman there will be a large well organized ground crew similar in many ways to the radio operators and personnel of the automobile business. The ground crew salesman should also all have wide experience and ability to personally sell the business man who should be in the market.

I have, Mr. Editor in prominence this, made an effort to show you what has been done in the educational field to encourage and properly prepare men for the industry. The Government economists, insurance and transportation future progress of aviation by regulation, engineering and licensing pilots, mechanics, and mechanics. This article, organization, management and personnel is, I believe, far beyond the usual high school or college level in these vital phases of the industry.

ALAN M. ROBBIE  
Superintendent of Education  
Aviation Business Center

## Editorial Comment FROM THE DAILY PRESS

### Stand Flying Over New York

THE editors which has just been commenced for business, whereby a place will be regularly over No 121 Wall Street and pick up bags by means of a new catapult device, would these outstanding mad dreams and should be published. It is necessary only to recall the recent catastrophe near Central Park to realize what law

bring over New York can result in; with thousands of people standing around an aircraft that has been landed to witness a crash could cause a terrible catastrophe. There is no excuse for the over-zealous project, as matters stand, for the law of it is as nearly an isolated state, nevertheless to advance the plane, the flyers, the catapult at the building, it is too tempting to justify the law that

a man who, if he looks toward collection of mail in the manner on a regular basis in the future, is a starting concern, and would cause a total crash disaster. The police should take whatever action is necessary to see that the plan is blocked.

—New York "World"

### Air Fares

THE editor took some for comparison of air transportation with rail is in sight with the announcement by several air transport companies that they have been refused that of train fares the Pullman charge.

It is realized that safety has been one of the big factors holding back

such transportation and the other. My one has been the cost. The average person could not afford to travel by plane. There has been a question whether air transport companies could afford to carry passengers at rail rates if they ever did. The railroads must add airplanes to competitors for swift and long hauls as they have had to add highways to competitors as a competitor for the short hauls.

Railroad consolidation apparently may not only take into consideration a reduction of rail rates but also may consider transportation companies as providing a choice of either road, rail or air. There seems to be some doubt as to the ultimate outcome of the transportation problem.

—CHICAGO (ILL.) REVIEW

## New Volumes FOR THE SHELVES

### Legal Problems of the Air

AIR LAW, EDITED, Vol. 1, No. 2, Jan 2nd, 1938. Edited by ALAN EBY, published quarterly by the Board of Air Law Review at New York University School of Law, 1500 6th Avenue, H-20 per copy. Office, Washington Square East, New York, N. Y.

WHEN THE OBJECT of reviewing and discussing all legal problems connected with aviation and radio, the Air Law Review has been suggested under the auspices of New York University. It is also the official journal of the American Section of the International Committee on Wireless Telegraphy.

Published in this country once a number of articles on legal and legislative subjects in these two fields, the enterprise will receive important directions to related subjects which have been given in the articles themselves, and will also contain comments on "The Progress of Air Law."

"HARSH" an excellent legal question, a summary on important "Decisions" highlighting precedents, and "Book Reviews" in specific sections under these headings.

On occasion in the first issue, quite properly and extremely, editors largely of summary and comment on the legal situation of the air at the present time, intensely and internationally. CLAUDE L. BOWEN, writing on "The Development of International Rules of Conduct in Air Navigation," published in length, good and material of general acceptance of the principle of non-interference in the airspace of other nations above its territory. This principle, resting at first upon

noninterference in the airspace, was widely asserted during the War, and definitely stated in the "Convention for the Regulation of Aerial Navigation" which was signed up in connection with the Peace Conference, at Paris in 1919. It was reaffirmed both by the Special American Congress of Aerial Navigation at Madrid in 1926, and by the Convention drawn up by a Pan-American Congress at Havana in 1928.

Accordingly, in Mr. Bowen's points out, "innocent passage" of an aircraft belonging to one country over the territory of another is a privilege to be obtained by international agreement, and not a right belonging to the nation of the aircraft.

Following the specific reason for this conclusion the author goes over the provisions of the Paris and Havana Conventions in considerable detail, interpreting them as they establish the present state national legal status of air navigation and as it should be.

Another article of importance is "State Regulation of Aircraft Companies" by CLAUDE L. BOWEN, which is a substantial chapter from the forthcoming book on "Aeronautical Law" by W. Jefferson Davis.

On occasion in the first issue, quite properly and extremely, editors largely of summary and comment on the legal situation of the air at the present time, intensely and internationally. CLAUDE L. BOWEN, writing on "The Development of International Rules of Conduct in Air Navigation," published in length, good and material of general acceptance of the principle of non-interference in the airspace of other nations above its territory. This principle, resting at first upon

and have has already been made, though the commentators involved have shown some reluctance to extend their authority beyond a casual, satisfactory acceptance of jurisdiction. Similarly, the Interstate Commerce Commission has shown an disposition to take up the question of aerial transport unless specifically instructed to do so by Congress.

As a result of this situation, in the opinion of Mr. Davis, there is too little regulation at present, but there is also some regulation in the form of a treaty. Control by the Department of Commerce seems rather satisfactory in general, but there are legal deficiencies. For example, the lack of uniformity of the laws adopted by a number of states which require conformity with Department of Commerce licensing regulations, and points out that the Department of Commerce cannot exempt the responsibility for oversteering, interpreting or radically differing its own rules. In conclusion, Mr. Davis confirms his recommendation that the creation of an Air Commerce Commission has been suggested as a possible solution of the problem.

The second "Survey of State Aeronautical Legislation, 1935-29," compiled by HARRY J. FREEMAN at the New York University School of Law for the Aeronautical Chamber of Commerce, and already made public in part by last issue, is here reprinted in full. The total of 314 bills introduced during this period, 352 of which were passed, is a significant reflection of the confusion which national aviation legislation is creating. It is noted that by comparison between states or federal laws.

These topics are explained in the article entitled "From the Platform" speaking on "Development of Aviation Laws in the United States," before the 1929 annual meeting of the New York State Bar Association, Chester W. Cappel, a capital and well known member of the legal staff, toward strength and strength companies, conducted with the provision of a detailed, and in aviation industry would be allowed to develop without too much legal restriction.

In "The Nature of the Right of Flight," an address delivered before the Greater New York Chapter of the New York State Bar Association, GEORGE B. LEON gives a history of laws and decisions, relative to the creation of air law, by the aircraft within national boundaries. Most important he has statement that either courts or legislatures had over the years been unable to legislate the law of the air above by an order of law, except as it is actually used for build-





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**ELECTRICAL WORLD**—A weekly publication reaching executives and engineers of control systems and electrical manufacturers, electrical engineers at industrial manufacturing consulting engineers, etc. Circulation more than 38,000.\*\*

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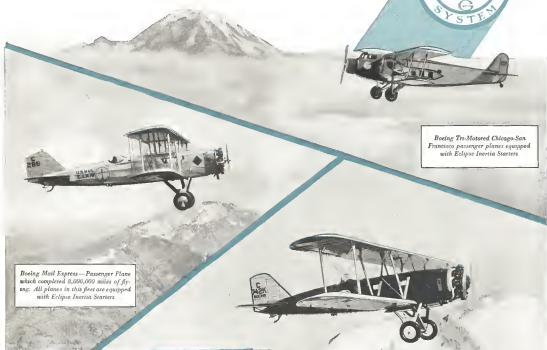








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